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108 Fox Run Drive, Collegeville, PA 19426 (US). **CASE-BIER, David, Scott** [US/US]; 161 Ember Lane, Carlisle, MA 01741 (US).

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(74) Agents: **KODROFF, Cathy, A.** et al.; Howson and Howson, Spring House Corporate Center, P.O. Box 457, Spring House, PA 19477 (US).

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(71) Applicants (for all designated States except US): **WYETH** [US/US]; Five Giralta Farms, Madison, NJ 07940 (US). **ARQUE, INC.** [US/US]; 19 Presidential Way, Woburn, MA 01801 (US).

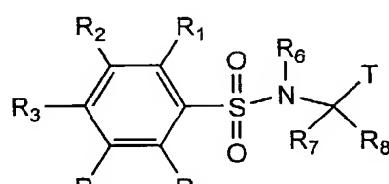
(72) Inventors; and

(75) Inventors/Applicants (for US only): **KREFT, Anthony, Frank** [US/US]; 43 Barley Court, Langhorne, PA 19047 (US). **COLE, Derek, Cecil** [IE/US]; 14 Renfrew Road, New City, NY 10956 (US). **WOLLER, Kevin, Roger** [US/US]; 2 Amandrey Way, Ayer, MA 01432 (US). **STOCK, Joseph, Raymond** [US/US]; 439 High Street, Monroe, NY 10950 (US). **KUTTERER, Kristina, Martha** [CA/US]; 624 Cambell Place, Westwood, NJ 07675 (US). **KUBRAK, Dennis, Martin** [US/US]; 3231 Gaul Street, Philadelphia, PA 19134 (US). **MANN, Charles, William** [US/US]; 122 South Fifth Street, North Wales, PA 19454 (US). **MOORE, William, Jay** [US/US];



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(54) Title: SUBSTITUTED PHENYLSULFONAMIDE INHIBITORS OF BETA AMYLOID PRODUCTION



(1)

(57) Abstract: Compounds of Formula I, wherein R<sub>1</sub>-R<sub>8</sub> are defined herein are provided, together with pharmaceutically acceptable salts, hydrates, metabolites, and/or prodrugs thereof. Uses of these compounds for inhibiting beta amyloid production and for the prevention and treatment of Alzheimer's Disease and Down's syndrome are described.

## SUBSTITUTED PHENYLSULFONAMIDE INHIBITORS OF BETA AMYLOID PRODUCTION

### CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application claims the benefit of US Patent Application No. 60/387,690, filed June 11, 2002, which is incorporated by reference herein.

### BACKGROUND OF THE INVENTION

This invention relates to small molecular compounds which inhibit beta  
10 amyloid production and have utility in the treatment of Alzheimer's disease.

Alzheimer's Disease (AD) is the most common form of dementia (loss of memory) in the elderly. The main pathological lesions of AD found in the brain consist of extracellular deposits of beta amyloid protein in the form of plaques and angiopathy and intracellular neurofibrillary tangles of aggregated  
15 hyperphosphorylated tau protein. Recent evidence has revealed that elevated beta amyloid levels in the brain not only precede tau pathology but also correlate with cognitive decline. Further suggesting a causative role for beta amyloid in AD, recent studies have shown that aggregated beta amyloid is toxic to neurons in cell culture and has a detrimental effect on memory. This suggests that reducing beta amyloid  
20 levels is a viable therapeutic strategy for the treatment of AD.

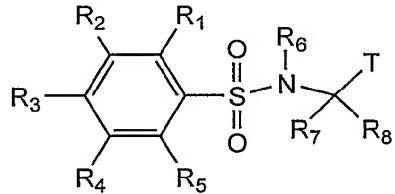
Beta amyloid protein is composed mainly of 39 to 42 amino acid peptides and is produced from a larger precursor protein called amyloid precursor protein (APP) by the sequential action of the proteases beta and gamma secretase. Although rare, cases of early onset AD have been attributed to genetic mutations in APP that lead to an  
25 overproduction of either total beta amyloid protein or its more aggregation-prone 42 amino acid isoform. Furthermore, people with Down's Syndrome possess an extra chromosome that contains the gene that encodes APP and thus have elevated beta amyloid levels and invariably develop AD later in life.

There continues to be a need for compositions useful in inhibiting beta  
30 amyloid production and in the prevention and treatment of Alzheimer's Disease.

## SUMMARY OF THE INVENTION

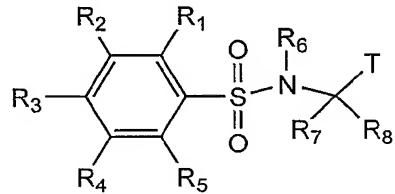
In one aspect, a method of lowering beta amyloid levels is provided which includes delivering to a patient a phenylsulfonamide compound and monitoring the beta amyloid levels in the patient.

- 5 In another aspect, a method of lowering beta amyloid levels is provided which includes delivering to a patient a compound of formula I:



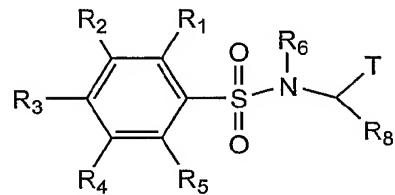
I

In a further aspect, a method of preventing or treating Alzheimer's disease is provided which includes delivering to a patient, a compound of formula I:



10

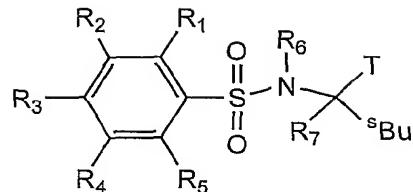
In yet another aspect, a compound of formula Ia is provided, wherein formula Ia is:



Ia

15

In a further aspect, a compound of formula Ib is provided, wherein formula Ib is:



Ib

Other aspects and advantages of the present invention are described further in the following detailed description of the preferred embodiments thereof.

## 5

## DETAILED DESCRIPTION OF THE INVENTION

The present invention provides methods of monitoring beta amyloid production in patients at risk for, or suffering from, AD and other diseases resulting from elevated levels of beta amyloid protein in the brain.

The present invention also provides methods of lowering beta amyloid levels 10 which includes delivering to a patient a pharmaceutically acceptable amount of a compound of the invention and monitoring the levels of beta-amyloid in the patient.

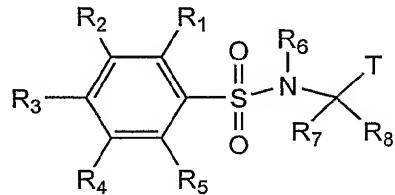
By the term "patient" as used herein is meant to describe a mammal which has been diagnosed as having or is at risk of having one or more of the conditions for which modulation of beta amyloid levels is desirable. Preferably, the patient is a 15 human, domestic animal, including canines and felines, or livestock and more preferably is a human. Thus, the compounds are useful for treatment and/or prevention of a number of human and veterinary conditions.

By the term "lowering beta amyloid levels" as used herein is meant to describe decreasing or inhibiting beta amyloid production in a patient. A variety of conditions 20 can be treated by lowering beta amyloid production in a patient and include Alzheimer's Disease, dementia, Down's Syndrome, and mild cognitive impairment, among others.

As used herein, the term "prevention" encompasses precluding the onset of symptoms in a patient who has been identified with or is at risk for a condition 25 resulting from elevated levels of beta amyloid protein in the brain. The patient may not have been diagnosed with the same or have not yet presented any symptoms thereof.

## I. Compositions of the Invention

In one embodiment, the present invention provides compounds of formula I:

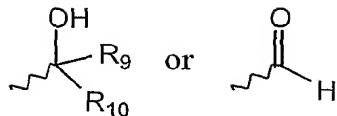


I

wherein:

- 5       $\text{R}_1$  is selected from the group consisting of H, halogen, and O;
- $\text{R}_2$  is selected from the group consisting of H, halogen, and N=N;
- $\text{R}_3$  is selected from the group consisting of H and halogen;
- $\text{R}_4$  is selected from the group consisting of H, halogen, amino, and N=N;
- $\text{R}_5$  is selected from the group consisting of H, halogen, methoxy, methyl, and
- 10     O;
- or
- $\text{R}_1$  and  $\text{R}_2$ ;  $\text{R}_2$  and  $\text{R}_3$ ;  $\text{R}_4$  and  $\text{R}_5$ ; or  $\text{R}_3$  and  $\text{R}_4$  are fused to form a carbon-based, naphthalene ring with the benzene ring;
- $\text{R}_6$  is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl,  $\text{CH}_2$  cycloalkyl,  $\text{CH}_2$ -2-furan,  $(\text{CH}_2)_2\text{SCH}_3$ , and  $(\text{CH}_2)_2\text{NHBOC}$ ;
- $\text{R}_7$  is selected from the group consisting of H, lower alkyl, and cycloalkyl;
- $\text{R}_8$  is selected from the group consisting of lower alkyl, substituted alkyl, cycloalkyl, phenyl, substituted phenyl, benzyl, substituted benzyl,  $\text{CH}_2$  cycloalkyl,
- 15      $\text{CH}_2$ -3-indole,  $\text{CH}(\text{lower alkyl})$ -2-furan,  $\text{CH}(\text{lower alkyl})$ -4-methoxyphenyl,  $\text{CH}(\text{lower alkyl})$  phenyl, and  $\text{CH}(\text{OH})$ -4-SCH<sub>3</sub>-phenyl; or
- $\text{R}_7$  and  $\text{R}_8$  are fused to form a saturated carbon-based ring;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, CF<sub>3</sub>,

5 lower alkenyl, methyl-substituted alkenyl, lower alkynyl, cycloalkyl, substituted phenyl,

1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

10 wherein:

(i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;

(ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;

(iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;

(iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a

15 heterocyclic ring;

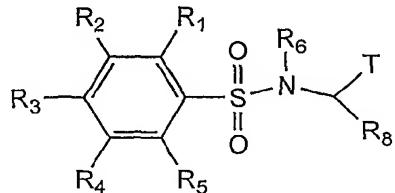
(v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and

(vi) at least one of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, and R<sub>5</sub> is halogen unless R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene

20 ring with the benzene ring;

or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

In another embodiment, the compound is of formula Ia:



Ia

wherein:

$R_1$  is selected from the group consisting of H, halogen, and O;

$R_2$  is selected from the group consisting of H, halogen, and N=N;

$R_3$  is selected from the group consisting of H and halogen;

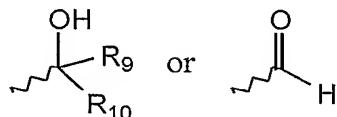
5        $R_4$  is selected from the group consisting of H, halogen, amino, and N=N;

$R_5$  is selected from the group consisting of H, halogen, methoxy, methyl, and  
O;

$R_6$  is selected from the group consisting of H, lower alkyl, lower alkenyl,  
3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl,  $CH_2$  cycloalkyl,  $CH_2$ -2-furan,  
10       $(CH_2)_2SCH_3$ , and  $(CH_2)_2NHBOC$ ;

15       $R_8$  is selected from the group consisting of n-propyl, iso-propyl, iso-butyl,  
n-butyl, t-butyl, substituted butyl, optionally substituted hexyl, optionally substituted  
heptyl, cycloalkyl,  $CH_2$  cycloalkyl, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-  
methoxyphenyl, CH(lower alkyl) phenyl, CH(OH)-4-SCH<sub>3</sub>-phenyl, and  $(CH_2)_2S$ -  
lower alkyl;

T is



$R_9$  and  $R_{10}$  are H; or

20       $R_9$  is H and  $R_{10}$  is selected from the group consisting of lower alkyl, lower  
alkenyl, methyl-substituted alkenyl, lower alkynyl, CF<sub>3</sub>, cycloalkyl, substituted  
phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

25       $R_9$  and  $R_{10}$  are independently selected from the group consisting of lower  
alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

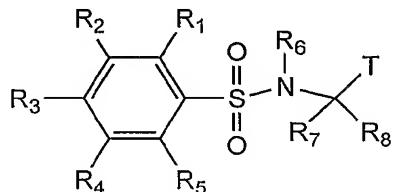
- (i)      when  $R_5$  is a methoxy;  $R_2$  is halogen and  $R_1$ ,  $R_3$ , and  $R_4$  are H;
- (ii)     when  $R_5$  is a methyl;  $R_1$  is halogen and  $R_2$ ,  $R_3$ , and  $R_4$  are H;
- (iii)    when  $R_4$  is an amino;  $R_3$  is halogen and  $R_1$ ,  $R_2$ , and  $R_5$  are H;
- (iv)     when  $R_2$  is N=N and  $R_1$  is O;  $R_2$  is bound to  $R_1$  to form a

30      heterocyclic ring;

(v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and

(vi) one or more of R<sub>1</sub> to R<sub>5</sub> is a halogen; or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

5 In a further embodiment, the compound is of formula I:



wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

10 R<sub>3</sub> is selected from the group consisting of H and halogen;

R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O; or

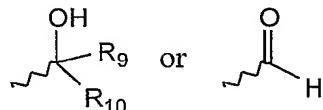
R<sub>1</sub> and R<sub>2</sub> or R<sub>4</sub> and R<sub>5</sub> are fused to form a carbon-based, unsaturated ring;

15 R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

R<sub>7</sub> is selected from the group consisting of H, lower alkyl, and cycloalkyl;

R<sub>8</sub> is selected from the group consisting of benzyl and substituted benzyl;

20 T is



R<sub>9</sub> and R<sub>10</sub> are H; or

25 R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, lower alkenyl, methyl-substituted alkenyl, CF<sub>3</sub>, lower alkynyl, cycloalkyl, substituted phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

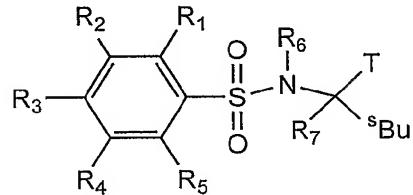
R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
- 5 (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
- (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
- (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring;
- (v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and
- 10 (vi) one or more of R<sub>1</sub> to R<sub>5</sub> is a halogen;

or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

In yet another embodiment, the compound is of formula Ib:



Ib

15 wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H, bromine, fluorine, and iodine;

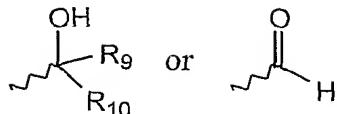
R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

20 R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;

R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

25 R<sub>7</sub> is selected from the group consisting of H, lower alkyl, and cycloalkyl;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, lower  
5 alkenyl, methyl-substituted alkenyl, CF<sub>3</sub>, lower alkynyl, cycloalkyl, substituted phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

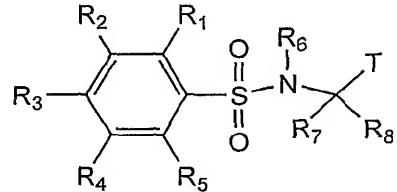
R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- 10 (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
- (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
- (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
- (iv) when R<sub>2</sub> or R<sub>4</sub> is N=N; R<sub>1</sub> or R<sub>5</sub> is O and R<sub>2</sub> or R<sub>4</sub> is bound to R<sub>1</sub> or R<sub>5</sub> to form a heterocyclic ring; and
- 15 (v) one or more of R<sub>1</sub> to R<sub>5</sub> is a halogen;

or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

In a further embodiment, the compound is of formula I:



I

wherein:

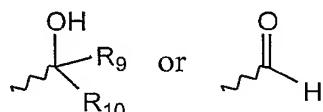
- 20 R<sub>1</sub> is selected from the group consisting of H, halogen, and O;
- R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;
- R<sub>3</sub> is selected from the group consisting of H and halogen;
- R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;
- R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and
- 25 O;

R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

R<sub>7</sub> is selected from the group consisting of lower alkyl and cycloalkyl;

5 R<sub>8</sub> is selected from the group consisting of cycloalkyl, phenyl, substituted phenyl, CH<sub>2</sub> cycloalkyl, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-methoxyphenyl, CH(lower alkyl) phenyl, and CH(OH)-4-SCH<sub>3</sub>-phenyl;

T is



10

R<sub>9</sub> and R<sub>10</sub> are H; or

R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, lower alkenyl, methyl-substituted alkenyl, lower alkynyl, CF<sub>3</sub>, cycloalkyl, substituted phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

15

R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

20

- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
- (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
- (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
- (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring; and

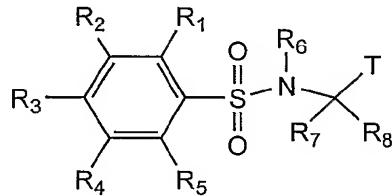
(v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and

25

(vi) one or more of R<sub>1</sub> to R<sub>5</sub> is a halogen;

or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

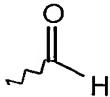
In yet a further embodiment, the compound is of formula I:



I

wherein:

- R<sub>1</sub> is selected from the group consisting of H, halogen, and O;
- 5 R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;
- R<sub>3</sub> is selected from the group consisting of H and halogen;
- R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;
- R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;
- 10 or
- R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;
- R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;
- 15 R<sub>7</sub> is selected from the group consisting of H, lower alkyl, and cycloalkyl;
- R<sub>8</sub> is selected from the group consisting of cycloalkyl, phenyl, substituted phenyl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-methoxyphenyl, CH(lower alkyl) phenyl, and CH(OH)-4-SCH<sub>3</sub>-phenyl;
- 20 or
- R<sub>7</sub> and R<sub>8</sub> are fused to form a saturated carbon-based ring;
- T is

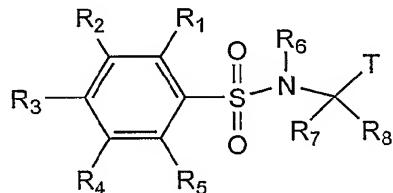


25

wherein:

- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
  - (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring;
  - (v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring;
  - (vi) when each of R<sub>1</sub>, R<sub>2</sub>, R<sub>4</sub>, R<sub>5</sub>, and R<sub>6</sub> is H, R<sub>3</sub> is halogen, and R<sub>7</sub> is H, then R<sub>8</sub> is C<sub>5</sub> to C<sub>8</sub> alkyl or R<sub>7</sub> and R<sub>8</sub> are fused to form a saturated carbon-based ring;
  - (vii) when each of R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, and R<sub>7</sub> is H and R<sub>1</sub> and R<sub>2</sub> are fused to form a carbon-based naphthalene ring, then R<sub>8</sub> is selected from the group consisting of lower alkyl, cycloalkyl, phenyl, substituted phenyl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-methoxyphenyl; CH(lower alkyl) phenyl, and CH(OH)-4-SCH<sub>3</sub>-phenyl;
  - (viii) when each of R<sub>1</sub>, R<sub>2</sub>, R<sub>4</sub>, R<sub>5</sub>, and R<sub>6</sub> is H and R<sub>3</sub> is halogen, then R<sub>7</sub> and R<sub>8</sub> are not both CH<sub>3</sub>; and
  - (ix) at least one of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, and R<sub>5</sub> is halogen unless R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;
- or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

In another embodiment, the compound is of formula I:



I

wherein:

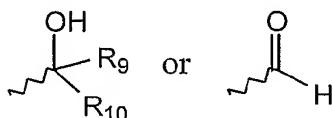
- R<sub>1</sub> is selected from the group consisting of H, halogen, and O;
- R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;
- R<sub>3</sub> is selected from the group consisting of H and halogen;
- R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

$R_5$  is selected from the group consisting of H, halogen, methoxy, methyl, and O;  
or

5       $R_1$  and  $R_2$ ;  $R_2$  and  $R_3$ ;  $R_4$  and  $R_5$ ; or  $R_3$  and  $R_4$  are fused to form a carbon-based, naphthalene ring with the benzene ring;

$R_6$  is selected from the group consisting of lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl,  $CH_2$  cycloalkyl,  $CH_2$ -2-furan,  $(CH_2)_2SCH_3$ , and  $(CH_2)_2NHBOC$ ;

10      $R_7$  and  $R_8$  are fused to form a saturated carbon-based ring;  
 $T$  is



$R_9$  and  $R_{10}$  are H; or

15      $R_9$  is H and  $R_{10}$  is selected from the group consisting of lower alkyl, lower alkenyl, methyl-substituted alkenyl,  $CF_3$ , lower alkynyl, cycloalkyl, substituted phenyl, 1-naphthyl, and  $CH_2CH_2$ -1,3-dioxolane; or

$R_9$  and  $R_{10}$  are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when  $R_5$  is a methoxy;  $R_2$  is halogen and  $R_1$ ,  $R_3$ , and  $R_4$  are H;
- 20    (ii) when  $R_5$  is a methyl;  $R_1$  is halogen and  $R_2$ ,  $R_3$ , and  $R_4$  are H;
- (iii) when  $R_4$  is an amino;  $R_3$  is halogen and  $R_1$ ,  $R_2$ , and  $R_5$  are H;
- (iv) when  $R_2$  is  $N=N$  and  $R_1$  is O;  $R_2$  is bound to  $R_1$  to form a heterocyclic ring;
- (v) when  $R_4$  is  $N=N$  and  $R_5$  is O;  $R_4$  is bound to  $R_5$  to form a heterocyclic ring; and
- 25    (vi) at least one of  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ , and  $R_5$  is halogen unless  $R_1$  and  $R_2$ ;  $R_2$  and  $R_3$ ;  $R_4$  and  $R_5$ ; or  $R_3$  and  $R_4$  are fused to form a carbon-based, naphthalene ring with the benzene ring;  
or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

In yet a further embodiment, the compound is selected from the group consisting of 2-bromo-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 3-bromo-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 3-chloro-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-chloro-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]-1,2,3-benzoxadiazole-7-sulfonamide, 2-chloro-4-fluoro-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 5-chloro-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]-2-methoxybenzenesulfonamide, 2-chloro-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]-6-methylbenzenesulfonamide, 3,5-dichloro-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 2,4-difluoro-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-fluoro-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 2-fluoro-N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl]naphthalene-1-sulfonamide, N-[(1S, 2S)-1-(hydroxymethyl)-2-methylbutyl] naphthalene-2-sulfonamide, 3-amino-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, N-[(1S)-1-benzyl-2-hydroxyethyl]-4-bromo benzenesulfonamide, 4-bromo-N-[(1S)-1-cyclohexyl-2-hydroxyethyl] benzenesulfonamide, 4-bromo-N-[(1R)-2-hydroxy-1-(4-hydroxyphenyl)ethyl] benzenesulfonamide, 4-bromo-N-[(1S)-1-(hydroxymethyl)-3-methylbutyl] benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-(1H-indol-2-ylmethyl)ethyl] benzenesulfonamide, 4-bromo-2,5-difluoro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 2,5-dibromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 3,4-dibromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 2,3-dichloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 3,4-dichloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 2,4,5-trichloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-bromo-2,5-difluoro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide, 3,4-dichloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide, 2,4,6-trichloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide, 3,4-dibromo-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide, 3,4-dichloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide, 2,4,5-trichloro-N-[(1S)-1-

(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide, 2,4,6-trichloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide, 4-bromo-N-[(1R,2R)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-bromo-N-[(1S)-1-(hydroxymethyl)-1,2-dimethylpropyl]benzenesulfonamide, 4-bromo-N-[1-(hydroxymethyl)-2-phenylpropyl] benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 4-chloro-N-[(1S)-1-(hydroxymethyl)-1,2-dimethylpropyl] benzenesulfonamide, 4-chloro-N-[1-(hydroxymethyl)-2-phenylpropyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, N-allyl-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, N-([1,1'-biphenyl]-4-ylmethyl)-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, tert-butyl 2-{{[4-chlorophenyl] sulfonyl}[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]amino} ethylcarbamate, 4-chloro-N-(4-chlorobenzyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 4-chloro-N-(cyclobutylmethyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 4-chloro-N-(3,4-dimethoxybenzyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-chloro-N-(2-furylmethyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-N-[2-(methylthio)ethyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-N-(3-phenylprop-2-ynyl) benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl) propyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-methyloctyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-phenylpropyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)butyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-4-methylpentyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylpentyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)pentyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-4-methyl-2-propylpentyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl) pentyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-propyloctyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-phenylpentyl] benzenesulfonamide, 4-chloro-N-

[(1S,2S)-1-(hydroxymethyl)-2-methylheptyl] benzenesulfonamide, 4-chloro-N-  
[(1S,2S)-2-ethyl-1-(hydroxymethyl)-heptyl] benzenesulfonamide, 4-chloro-N-  
[(1S,2R)-1-(hydroxymethyl)-2-pentyloctyl] benzenesulfonamide, 4-chloro-N-  
[(1S,2S)-1-(hydroxymethyl)-2-phenylpropyl] benzenesulfonamide, 4-chloro-N-  
5 [(1S,2S)-1-(hydroxymethyl)-4-methyl-2-phenylpentyl] benzenesulfonamide, 4-  
chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-phenyloctyl] benzenesulfonamide, 4-chloro-  
N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)butyl] benzenesulfonamide, 4-chloro-N-  
[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)-4-methyl pentyl]benzenesulfonamide, 4-  
chloro-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)octyl] benzenesulfonamide, 4-  
10 chloro-N-[(1S,2S)-1-(hydroxymethyl)-2,3-dimethylbutyl] benzenesulfonamide, 4-  
chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-isopropyl octyl] benzenesulfonamide, 4-  
bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl)  
propyl]benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-methyloctyl]  
benzenesulfonamide, 4-bromo-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)-4-  
15 methylpentyl] benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-  
methoxyphenyl) butyl]benzenesulfonamide, 4-bromo-N-[(1S,2R)-2-ethyl-1-  
(hydroxymethyl)octyl] benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-  
2-methylpentyl] benzenesulfonamide, 4-bromo-N-[(1S,2S)-2-ethyl-1-  
(hydroxymethyl) pentyl] benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-  
20 (hydroxymethyl)-4-methyl-2-propylpentyl] benzenesulfonamide, 4-bromo-N-  
[(1S,2R)-1-(hydroxymethyl)-2-propyl octyl] benzenesulfonamide, 4-bromo-N-  
[(1S,2S)-1-(hydroxymethyl)-2-methylheptyl] benzenesulfonamide, 4-bromo-N-  
[(1S,2S)-2-ethyl-1 -(hydroxymethyl) heptyl] benzenesulfonamide, 4-bromo-N-  
[(1S,2S)-1-(hydroxymethyl)-2-phenylpropyl] benzenesulfonamide, 4-bromo-N-  
25 [(1S,2S)-1-(hydroxymethyl)-2-phenylbutyl] benzenesulfonamide, 4-bromo-N-  
[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)propyl] benzenesulfonamide, 4-bromo-N-  
[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)butyl] benzenesulfonamide, 4-bromo-N-  
[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)-4-methylpentyl]benzenesulfonamide, 4-  
bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-isopropyl-4-  
30 methylpentyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)-  
octyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)octyl]  
benzenesulfonamide, 4-chloro- N-methyl-N-[(1S,2S)-1-(hydroxymethyl)-2-

methylbutyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-chloro-N-[(1S)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide, 4-chloro-N-[(1R,2S)-2-hydroxy-1-methyl-2-phenylethyl]benzenesulfonamide, 4-bromo-N-[1-

5 (hydroxymethyl)cyclopentyl]benzenesulfonamide, 4-chloro-N-[(1S)-2-cyclohexyl-1-(hydroxymethyl)ethyl]benzenesulfonamide, N-{(1S)-1-[4-(benzyloxy)benzyl]-2-hydroxyethyl}-4-chlorobenzenesulfonamide, 4-chloro-N-[(1R)-1-(hydroxymethyl)-1-methylpropyl]benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-bromo-N-[1-(hydroxymethyl)

10 pentyl]benzenesulfonamide, 4-bromo-N-[(1R,2S)-2-hydroxy-1-methyl-2-phenylethyl]benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-phenylethyl]benzenesulfonamide, 4-bromo-N-[(1R)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide, 4-chloro-N-[1-(hydroxymethyl)cyclopentyl]benzenesulfonamide, 4-bromo-N-[1-

15 (hydroxymethyl)butyl]benzenesulfonamide, 3-chloro-N-[1-(hydroxymethyl)butyl]benzenesulfonamide, 3-chloro-N-[(1S)-2-cyclohexyl-1-(hydroxymethyl)ethyl]benzenesulfonamide, 3-chloro-N-[(1R)-1-(hydroxymethyl)-3-(methylthio)propyl]benzenesulfonamide, 3-chloro-N-[(1S)-1-(hydroxymethyl)propyl]benzenesulfonamide, 2-fluoro-N-[(1S)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide, 2-fluoro-N-[1-(hydroxymethyl)pentyl]

20 benzenesulfonamide, 2-fluoro-N-[(1R,2S)-2-hydroxy-1-methyl-2-phenylethyl]benzenesulfonamide, 2-fluoro-N-[(1S)-2-hydroxy-1-phenylethyl]benzenesulfonamide, 2-fluoro-N-[(1R)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide, 2-fluoro-N-[1-

25 (hydroxymethyl)cyclopentyl]benzenesulfonamide, N-[(1S)-2-cyclohexyl-1-(hydroxymethyl)ethyl]-2-fluorobenzenesulfonamide, 2-fluoro-N-{(1S,2S)-2-hydroxy-1-(hydroxymethyl)-2-[4-(methylthio)phenyl]ethyl}benzenesulfonamide, 2-fluoro-N-[(1S)-1-(hydroxy-1-methylethyl)]benzenesulfonamide, N-[(1S)-1-benzyl-2-hydroxyethyl]-2-fluorobenzenesulfonamide, 2-fluoro-N-[(1S)-1-(hydroxymethyl)-2-

30 methylpropyl]benzenesulfonamide, 4-bromo-N-[1-(hydroxymethyl)cyclohexyl]benzenesulfonamide, 4-bromo-N-[2-(hydroxymethyl)bicyclo[2.2.1.]hept-2-yl]benzenesulfonamide, 4-bromo-N-[1-

(hydroxymethyl)-2,3-dihydro-1H-inden-1-yl]benzenesulfonamide, 4-chloro-N-[1-(hydroxymethyl)cyclohexyl]benzenesulfonamide, 4-chloro-N-[1-(hydroxymethyl)-2,3-dihydro-1H-inden-1-yl]benzenesulfonamide, 4-chloro-N-(1-cyclobutyl-2-hydroxy-1-phenylethyl)benzenesulfonamide, 4-fluoro-N-[(1S,2S)-1-(1-hydroxyethyl)-2-methylbutyl]benzenesulfonamide, N-{(1S,2S)-1-  
5 [cyclopentyl(hydroxy)methyl]-2-methylbutyl}-4-fluorobenzenesulfonamide, 4-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide, 4-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl}benzenesulfonamide, 4-fluoro-N-  
10 {(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide, 4-fluoro-N-  
{(1S,2S)-1-[hydroxy-(2-methylphenyl)methyl]-2-methylbutyl}benzenesulfonamide, 4-fluoro-N-  
{(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-fluoro-N-  
15 -{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-butenyl}benzenesulfonamide, 4-fluoro-N-  
{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}benzenesulfonamide, 4-fluoro-N-  
{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, N-{(1S,2S)-1-[(4-  
chlorophenyl)(hydroxy)methyl]-2-methylbutyl}-4-fluorobenzenesulfonamide, 4-  
fluoro-N-{(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]-3-  
20 pentenyl}benzenesulfonamide, 4-fluoro-N-{(1S)-2-hydroxy-3-methyl-1-[(1S)-1-  
methylpropyl]-3-but enyl}benzenesulfonamide, 4-fluoro-N-  
{(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-  
{(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}-4-fluorobenzenesulfonamide, 4-  
fluoro-N-  
25 {(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide, 4-fluoro-N-  
{(1S,2S)-1-{hydroxy[4-(methylsulfanyl)phenyl]methyl}-2-methylbutyl}benzenesulfonamide, N-  
{(1S,2S)-1-[[4-(dimethylamino)phenyl](hydroxy)methyl]-2-methylbutyl}-4-  
fluorobenzenesulfonamide, 4-fluoro-N-  
30 -{(1S,2S)-1-[hydroxy(1-naphthyl)methyl]-2-methylbutyl}benzenesulfonamide, 4-bromo-N-  
{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl}benzenesulfonamide, 4-bromo-N-  
{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide, 4-bromo-N-  
{(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-

bromo-N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-  
methylpropyl]pentyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-  
methylpropyl]-3-butenyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-  
1-methylpropyl]-4-pentenyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-  
5 [(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-[(4-  
fluorophenyl) (hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-bromo-N-  
{(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl} benzenesulfonamide,  
4-bromo-N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]-3-  
10 pentenyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-3-methyl-1-[(1S)-1-  
methylpropyl]-3-butenyl}benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-[hydroxy(4-  
methoxyphenyl)methyl]-2-methylbutyl} benzenesulfonamide, 4-bromo-N-[(1S,3E)-  
2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]-3-pentenyl}benzenesulfonamide, 4-  
15 bromo-N-[(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}  
benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-  
hexenyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-  
3-pentynyl}benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-{hydroxy-[4-  
20 (methylsulfanyl)phenyl]methyl}-2-methylbutyl} benzenesulfonamide, 4-bromo-N-  
{(1S,2S)-1-[[4-(dimethylamino)phenyl](hydroxy) methyl]-2-methylbutyl}  
benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-formyl-2-methylbutyl]  
benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(1-hydroxyethyl)-2-methylbutyl]  
25 benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-  
methylbutyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-  
methylpropyl] octyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-  
methylpropyl] heptyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-  
25 methylpropyl] hexyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-3-methyl-1-  
[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[hydroxy(2-  
methylphenyl)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-  
hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl} benzenesulfonamide, 4-chloro-  
N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl] pentyl}benzenesulfonamide, 4-  
30 chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-but enyl}benzenesulfonamide,  
4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-  
pentenyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]

butyl}benzenesulfonamide, 4-chloro-N-{(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-{(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-{(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide, 4-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-pentynyl}benzenesulfonamide, 4-chloro-N-{(1S,2S)-1-[(hydroxy[4-(methylsulfanyl)phenyl]methyl)-2-methylbutyl]benzenesulfonamide, 4-chloro-N-{(1S,2S)-1-[(4-(dimethylamino)phenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-{(1S,2S)-1-[(hydroxy(1-naphthyl)methyl)-2-methylbutyl]benzenesulfonamide, 3-chloro-N-{(1S,2S)-1-[(1-hydroxyethyl)-2-methylbutyl]benzenesulfonamide, 3-chloro-N-{(1S,2S)-1-[(cyclopentyl(hydroxy)methyl)-2-methylbutyl]benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-butenyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 3-chloro-N-{(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 3-chloro-N-{(1S,2S)-1-[(hydroxy(4-methoxyphenyl)methyl)-2-methylbutyl]benzenesulfonamide, 3-chloro-N-{(1S,2S)-1-[(hydroxy(4-methoxyphenyl)methyl)-2-methylbutyl]-2-methylbutyl}benzenesulfonamide, 3-chloro-N-{(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide, 3-chloro-N-{(hydroxy[4-(methylsulfanyl)phenyl]methyl)-2-methylbutyl}benzenesulfonamide, N-{(1S,2S)-1-[(cyclopentyl(hydroxy)methyl)-2-methylbutyl]-2-fluorobenzenesulfonamide, 2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-

methylpropyl]octyl}benzenesulfonamide, 2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl}benzenesulfonamide, 2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide, 2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-butenyl}benzenesulfonamide, 2-fluoro-N-{(1S,2S)-1-[(4-fluorophenyl) (hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, N-{(1S,2S)-1-[(4-chlorophenyl) (hydroxy)methyl]-2-methylbutyl}-2-fluorobenzenesulfonamide, 2-fluoro-N-{(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-{(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl] butyl}-2-fluorobenzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-methylbutyl]benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl}benzenesulfonamide, 4-bromo-N-{(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-[(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl]-4-bromo benzenesulfonamide, 4-bromo-N-[(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl] butyl}benzenesulfonamide, N-[(1S,2S)-1-[bis(4-chlorophenyl) (hydroxy)methyl]-2-methylbutyl]-4-bromobenzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-butenyl}benzenesulfonamide, 4-bromo-N-[(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-{hydroxy[di(1-naphthyl)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-methylbutyl]benzenesulfonamide, 4-chloro-N-[(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide, N-[(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl]-4-chlorobenzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-[(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl]-4-chlorobenzenesulfonamide, 4-chloro-N-[(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]

butyl}benzenesulfonamide, 4-chloro-N-{(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-butenyl} benzenesulfonamide, 4-chloro-N-((1S,2S)-1-{hydroxy [bis(4-methoxyphenyl)]methyl}-2-methylbutyl)benzenesulfonamide, 4-chloro-N-{(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-  
5 methylpropyl]-3-pentenyl}benzenesulfonamide, N-{(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methyl propyl]-5-hexenyl}-4-chlorobenzenesulfonamide, 4-chloro-N-((1S,2S)-1-{hydroxy[di(1-naphthyl)]methyl}-2-methylbutyl)benzenesulfonamide, 4-fluoro-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-methylbutyl]benzenesulfonamide, 4-fluoro-N-{(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-  
10 methylpropyl]octyl}benzenesulfonamide, 4-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl}benzenesulfonamide, N-{(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}-4-fluorobenzenesulfonamide, 4-fluoro-N-{(1S)-2-  
hydroxy-2-isopropyl-3-methyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-fluoro-N-{(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-  
15 methylpropyl]pentyl}benzenesulfonamide, N-{(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}-4-fluoro benzenesulfonamide, N-{(1S)-2-ethyl-2-  
hydroxy-1-[(1S)-1-methylpropyl]butyl}-4-fluorobenzenesulfonamide, 4-fluoro-N-{(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-  
butenyl}benzenesulfonamide, 4-fluoro-N-((1S,2S)-1-{hydroxy[bis(4-  
20 methoxyphenyl)]methyl}-2-methylbutyl)benzenesulfonamide, 4-fluoro-N-{(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-  
pentenyl}benzenesulfonamide, N-{(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}-4-fluorobenzenesulfonamide, N-{(1S,2S)-1-[bis[4-  
25 (dimethylamino)phenyl] (hydroxy)methyl]-2-methylbutyl}-4-  
fluorobenzenesulfonamide, 4-fluoro-N-((1S,2S)-1-{hydroxy[di(1-naphthyl)]methyl}-2-methylbutyl)benzenesulfonamide, 3-chloro-N-{(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-  
methylpropyl]octyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-  
methylpropyl]-2-pentylheptyl}benzenesulfonamide, N-{(1S)-2-butyl-2-hydroxy-1-[(1S)-1-  
30 methylpropyl]hexyl}-3-chlorobenzenesulfonamide, 3-chloro-N-{(1S)-2-  
hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, 3-chloro-N-{(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-{(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}-3-chloro

benzenesulfonamide, 3-chloro-N-[(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl] benzenesulfonamide, N-[(1S,2S)-1-[bis(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl]-3-chloro benzenesulfonamide, 3-chloro-N-[(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-butenyl]benzenesulfonamide, 3-chloro-N-((1S,2S)-1-{hydroxy [bis(4-methoxyphenyl)]methyl}-2-methylbutyl)benzenesulfonamide, 3-chloro-N-[(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl] benzenesulfonamide, N-[(1S)-2-(3-butenyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl]-3-chlorobenzenesulfonamide, 2-fluoro-N-[(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl]benzenesulfonamide, 2-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl]benzenesulfonamide, 2-fluoro-N-[(1S,2S)-1-[hydroxy (diphenyl)methyl]-2-methylbutyl]benzenesulfonamide, N-[(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl]-2-fluorobenzenesulfonamide, N-[(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]-2-fluorobenzenesulfonamide, N-[(1S,2S)-1-[bis(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl]-2-fluoro benzenesulfonamide, 2-fluoro-N-[(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-but enyl] benzenesulfonamide, 2-fluoro-N-((1S,2S)-1-{hydroxy[bis(4-methoxyphenyl)]methyl}-2-methylbutyl)benzenesulfonamide, 2-fluoro-N-[(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl] benzenesulfonamide, N-[(1S)-2-(3-butenyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl]-2-fluorobenzenesulfonamide, 4-chloro-N-[(1S)-1-cyclohexyl-2-hydroxyethyl] benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-phenylethyl] benzenesulfonamide, 4-chloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl] benzenesulfonamide, 4-bromo-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl] benzenesulfonamide, 4-iodo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, and 4-chloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl] benzenesulfonamide; or a pharmaceutically acceptable salt, hydrate, metabolite, or prodrug thereof.

In another embodiment, the compound is 4-chloro-N-[(1S)-2-ethyl-1-(hydroxymethyl)butyl]benzenesulfonamide or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof

The compounds of the invention can contain one or more asymmetric carbon atoms and some of the compounds can contain one or more asymmetric (chiral) centers and can thus give rise to optical isomers and diastereomers. While shown without respect to stereochemistry, when the compounds can contain one or more chiral centers, preferably at least one of the chiral centers is of S-stereochemistry. Most preferably, the carbon atom to which N, T, R<sub>7</sub> and R<sub>8</sub> are attached is of S-stereochemistry. Thus, the invention includes such optical isomers and diastereomers; as well as the racemic and resolved, enantiomerically pure stereoisomers; as well as other mixtures of the R and S stereoisomers, and pharmaceutically acceptable salts, hydrates, metabolites, and prodrugs thereof.

The term "alkyl" is used herein to refer to both straight- and branched-chain saturated aliphatic hydrocarbon groups having about one to about ten carbon atoms, preferably one to eight carbon atoms and, most preferably, one to six carbon atoms. The term "lower alkyl" is used herein to refer to straight- and branched-chain saturated aliphatic hydrocarbon groups having about one to about six carbon atoms. The term "alkenyl" is used herein to refer to straight- and branched-chain alkyl groups having at least one carbon-carbon double bond and about two to about eight carbon atoms, preferably two to six carbon atoms. The term "alkynyl" is used herein to refer to straight- and branched-chain alkyl groups having at least one carbon-carbon triple bond and about two to about eight carbon atoms, preferably two to six carbon atoms.

The terms "substituted alkyl", "substituted alkenyl", and "substituted alkynyl" refer to alkyl, alkenyl, and alkynyl as just described having from one to three substituents selected from the group consisting of halogen, CN, OH, NO<sub>2</sub>, amino, aryl, heterocyclic, substituted aryl, substituted heterocyclic, alkoxy, aryloxy, substituted alkyloxy, alkylcarbonyl, alkylcarboxy, alkylamino, and arylthio, which groups can be optionally substituted. These substituents can be attached to any carbon of an alkyl, alkenyl, or alkynyl group provided that the attachment constitutes a stable chemical moiety.

The term "aryl" is used herein to refer to a carbocyclic aromatic system, which can be a single ring, or multiple aromatic rings fused or linked together as such that at least one part of the fused or linked rings forms the conjugated aromatic system. The aryl groups include, but are not limited to, phenyl, naphthyl, biphenyl, anthryl, 5 tetrahydronaphthyl, and phenanthryl.

The term "substituted aryl" refers to aryl as just defined having one or more substituents including halogen, CN, OH, NO<sub>2</sub>, amino, alkyl, cycloalkyl, alkenyl, alkynyl, alkoxy, aryloxy, substituted alkyloxy, alkylcarbonyl, alkylcarboxy, alkylamino, and arylthio. Preferably, a substituted aryl group is substituted with one 10 to about four substituents.

The term "heterocyclic" is used herein to describe a stable 4- to 7-membered monocyclic or a stable multicyclic heterocyclic ring which is saturated, partially unsaturated, or wholly unsaturated. The heterocyclic ring has in its backbone carbon atoms and one or more heteroatoms including N, O, and S atoms. Preferably, the 15 heterocyclic ring has about 1 to about 4 heteroatoms in the backbone of the ring. When the heterocyclic ring contains nitrogen or sulfur atoms in the backbone of the ring, the nitrogen or sulfur atoms can be oxidized. The heterocyclic ring also includes any multicyclic ring in which any of the above defined heterocyclic rings is fused to an aryl ring. The heterocyclic ring can be attached at any heteroatom or carbon atom 20 provided the resultant structure is chemically stable.

A variety of heterocyclic groups are known in the art and include, without limitation, oxygen-containing rings, nitrogen-containing rings, sulfur-containing rings, mixed heteroatom-containing rings, fused heteroatom containing rings, and combinations thereof. Oxygen-containing rings include, but are not limited to, furyl, 25 tetrahydrofuranyl, pyranyl, pyronyl, and dioxinyl rings. Nitrogen-containing rings include, without limitation, pyrrolyl, pyrazolyl, imidazolyl, triazolyl, pyridyl, piperidinyl, 2-oxopiperidinyl, pyridazinyl, pyrimidinyl, pyrazinyl, piperazinyl, azepinyl, triazinyl, pyrrolidinyl, and azepinyl rings. Sulfur-containing rings include, without limitation, thienyl and dithioliyl rings. Mixed heteroatom containing rings 30 include, but are not limited to, oxathioliyl, oxazolyl, thiazolyl, oxadiazolyl, oxatriazolyl, dioxazolyl, oxathiazolyl, oxathioliyl, oxazinyl, oxathiazinyl, morpholinyl, thiamorpholinyl, thiamorpholinyl sulfoxide, oxepinyl, thiепинyl, and diazepinyl rings.

Fused heteroatom-containing rings include, but are not limited to, benzofuranyl, benzo[b]thienyl or benzo[c]thienyl, indolyl, benazazolyl, purindinyl, pyranopyrrolyl, isoindazolyl, indoxazinyl, benzoxazolyl, anthranilyl, benzopyranyl, quinolinyl, isoquinolinyl, benzodiazonyl, naphthyridinyl, benzothienyl, pyridopyridinyl, 5 benzoxazinyl, xanthenyl, acridinyl, and purinyl rings.

As used herein, an N-substituted piperidinyl group can be defined as a substituted heterocyclic group. Among particularly desirable substituents are N-alkyl-, N-aryl-, N-acyl-, and N-sulfonyl piperidinyl groups. One particularly suitable N-acyl-piperidinyl group is N-t-butyloxycarbonyl (BOC)-piperidine. 10 However, other suitable substituents can be readily identified by one of skill in the art.

The term “substituted heterocyclic” is used herein to describe a heterocyclic group having one or more substituents including halogen, CN, OH, NO<sub>2</sub>, amino, alkyl, substituted alkyl, cycloalkyl, alkenyl, substituted alkenyl, alkynyl, alkoxy, aryloxy, substituted alkyloxy, alkylcarbonyl, alkylcarboxy, alkylamino, and arylthio. 15 Preferably, a substituted heterocyclic group has 1 to about 4 substituents.

The term “alkoxy” is used herein to refer to the O(alkyl) group, where the point of attachment is through the oxygen-atom and the alkyl group is optionally substituted. The term “aryloxy” is used herein to refer to the O(aryl) group, where the point of attachment is through the oxygen-atom and the aryl group is optionally 20 substituted.

The term “alkylcarbonyl” is used herein to refer to the CO(alkyl) group, where the point of attachment is through the carbon-atom of the carbonyl moiety and the alkyl group is optionally substituted.

The term “alkylcarboxy” is used herein to refer to the COO(alkyl) group, 25 where the point of attachment is through the carbon-atom of the carboxy group and the alkyl group is optionally substituted.

The term “aminoalkyl” is used herein to refer to secondary and tertiary amines where the point of attachment is through the nitrogen-atom and the alkyl groups are 30 optionally substituted. Preferably, the alkyl groups contain one to eight carbon atoms and can be either same or different.

The term “halogen” refers to Cl, Br, F, or I.

The term “ring” structure, e.g., when R<sub>3</sub> and R<sub>4</sub> can form a ring structure, includes a monocyclic structure, a bridged cyclo structure, and fused cyclo structures, unless the type of ring structure is otherwise specified.

The compounds of the present invention encompass tautomeric forms of the structures provided herein characterized by the bioactivity of the exemplary compounds and drawn structures. Further, the compounds of the present invention can be used in the form of salts derived from pharmaceutically or physiologically acceptable acids, bases, alkali metals and alkaline earth metals.

Physiologically acceptable acids include those derived from inorganic and organic acids. A number of inorganic acids are known in the art and include hydrochloric, hydrobromic, hydroiodic, sulfuric, nitric, and phosphoric acids, among others. Similarly, a variety of organic acids are known in the art and include, without limitation, lactic, formic, acetic, fumaric, citric, propionic, oxalic, succinic, glycolic, glucuronic, maleic, furoic, glutamic, benzoic, anthranilic, salicylic, tartaric, malonic, malic, phenylacetic, mandelic, embonic, methanesulfonic, ethanesulfonic, panthenoic, benzenesulfonic, toluenesulfonic, stearic, sulfanilic, alginic, and galacturonic acids, among others.

Physiologically acceptable bases include those derived from inorganic and organic bases. A number of inorganic bases are known in the art and include aluminum, calcium, lithium, magnesium, potassium, sodium, and zinc hydroxide compounds, among others. A number of organic bases are known in the art and include, without limitation, N,N,-dibenzylethylenediamine, chloroprocaine, choline, diethanolamine, ethylenediamine, meglumine, and procaine, among others.

Physiologically acceptable alkali salts and alkaline earth metal salts can include, without limitation, sodium, potassium, calcium and magnesium salts in the form of esters, hydroxides, and carbamates. Other conventional “pro-drug” forms can also be utilized which, when delivered in such form, convert to the active *moiety in vivo*.

These salts, as well as other compounds of the invention can be in the form of esters, carbamates and other conventional “pro-drug” forms, which, when administered in such form, convert to the active moiety *in vivo*. In a currently preferred embodiment, the prodrugs are esters. See, e.g., B. Testa and J. Caldwell,

“Prodrugs Revisited: The “Ad Hoc” Approach as a Complement to Ligand Design”, Medicinal Research Reviews, 16(3):233-241, ed., John Wiley & Sons (1996).

The compounds discussed herein also encompass “metabolites” which are unique products formed by processing the compounds of formula I, Ia, or Ib by the 5 cell or patient. Preferably, metabolites are formed *in vivo*.

The compounds of the present invention can be prepared in a number of ways well known to one skilled in the art. The compounds of the present invention can be prepared using the methods described below, together with synthetic methods known in the synthetic organic arts or variations of these methods by one skilled in the art.

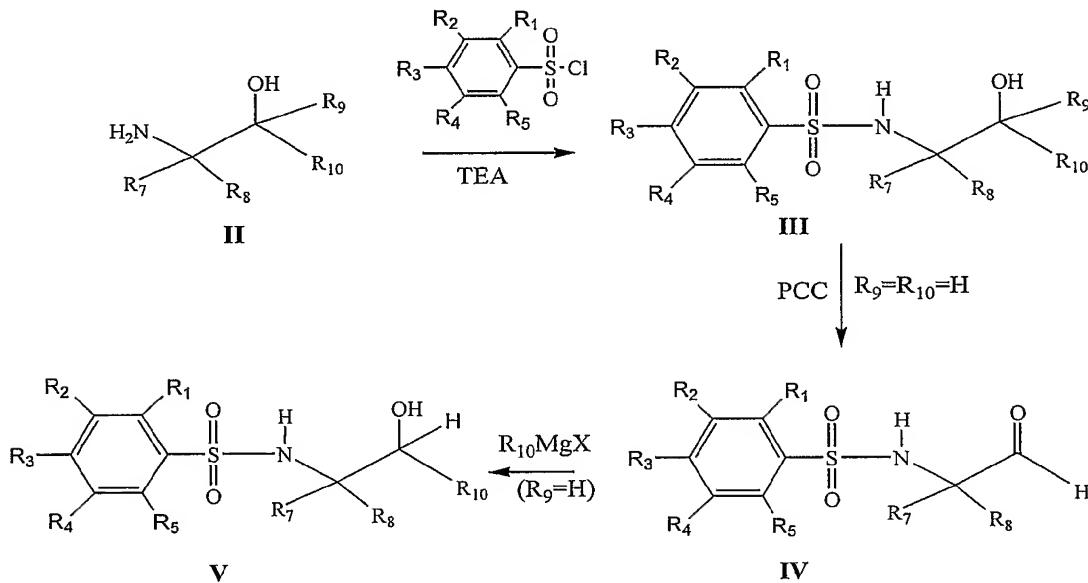
10 See, generally, Comprehensive Organic Synthesis, “Selectivity, Strategy & Efficiency in Modern Organic Chemistry”, ed., I. Fleming, Pergamon Press, New York (1991); Comprehensive Organic Chemistry, “The Synthesis and Reactions of Organic Compounds”, ed. J.F. Stoddard, Pergamon Press, New York (1979). Preferred methods include, but are not limited to, those outlined below.

15 In certain embodiments, it may be desirable to utilize chirally pure  $\alpha$ -amino acids, 1,2-aminoalcohols, N-sulfonyl  $\alpha$ -amino acids, and N-sulfonyl 1,2-aminoalcohols in the reactions described herein for the production of the phenylsulfonamides of the invention. A number of methods for producing these compounds are known in the art. Among desirable methodologies are those described 20 in US Patent Application No. 60/339,264, filed December 11, 2001, and later filed as US Patent Application No. 10/304,322 and International Patent Application PCT/US02/38119, both filed November 26, 2002, “Process for the Synthesis of Chirally Pure  $\alpha$ -Amino-Alcohols”; US Patent Application No. 10/014,304, filed December 11, 2001, entitled “Heterocyclic Sulfonamide Inhibitors of Beta Amyloid 25 Production”, published as US-2002-0183361-A on December 5, 2002; and US Patent Application No. 10/166,896, filed June 11, 2002 and later published January 16, 2003 as US-2003-0013892-A1, entitled “Production of Chirally Pure  $\alpha$ -Amino Acids and N-Sulfonyl  $\alpha$ -Amino Acids”.

A first method of preparation for the compounds of the invention consists of 30 reaction of a 1,2-aminoalcohol II with the appropriate sulfonyl halide in the presence of a base such as triethylamine (TEA) and in a suitable solvent to afford compounds of formula III. For compounds where R<sub>9</sub> and R<sub>10</sub> are hydrogen, oxidation of the N-

sulfonyl primary alcohol with pyridinium chlorochromate (PCC) or under Swern conditions then affords the corresponding aldehyde IV which can be reacted with Grignard reagents to afford the secondary alcohols V as a mixture of diastereomers which can be separated by high performance liquid chromatography (HPLC) or other suitable methods (Scheme 1).

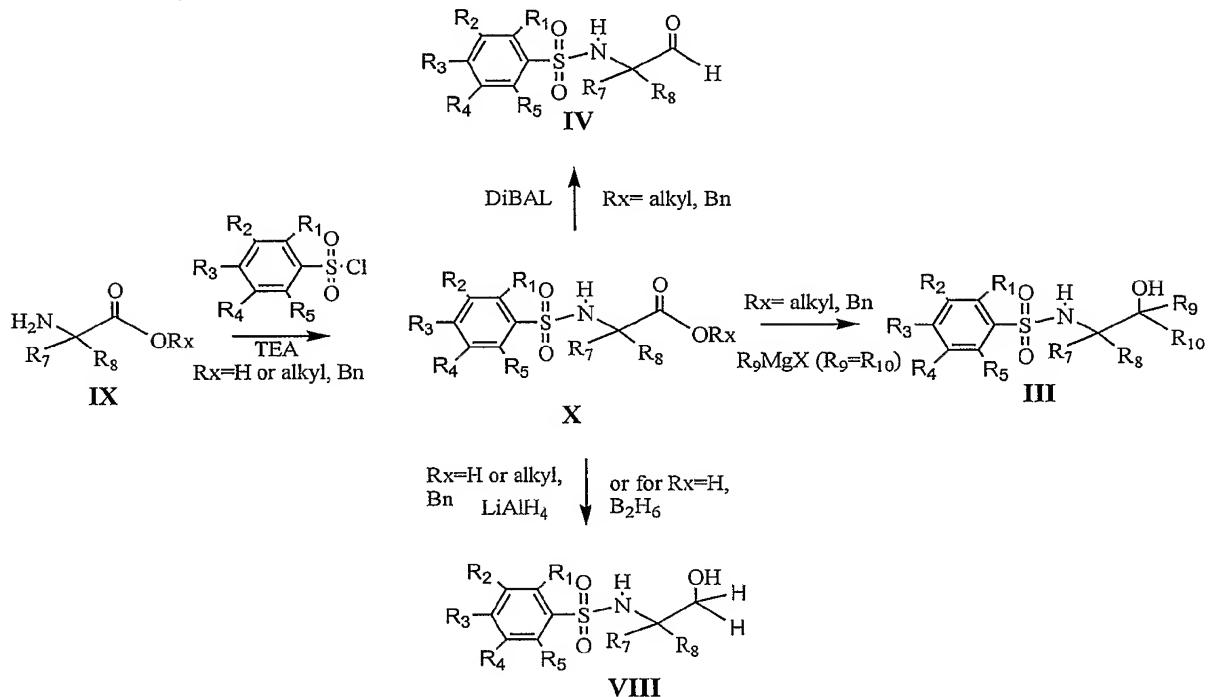
Scheme 1



A second method of preparation involves reaction of an  $\alpha$ -amino acid or ester IX with the appropriate sulfonyl halide in the presence of a base such as triethylamine 10 and in a suitable solvent to afford compounds of formula X (Scheme 2). The intermediate N-sulfonyl acid X (Rx=H) can be converted to the corresponding primary alcohol VIII (R<sub>9</sub>=R<sub>10</sub>=H) utilizing standard methodology such as LiAlH<sub>4</sub> (LAH), B<sub>2</sub>H<sub>6</sub> or cyanuric chloride/NaBH<sub>4</sub>. The intermediate N-sulfonyl ester X (Rx=alkyl, Bn) can also be reduced to the corresponding primary alcohol VIII 15 utilizing standard methodology such as LiAlH<sub>4</sub>. Alternatively, the intermediate N-sulfonyl ester X (Rx=alkyl, Bn) can be converted to the aldehyde IV with diisobutyl aluminumhydride (DiBAL). Finally, the intermediate N-sulfonyl ester X (Rx=alkyl, Bn) can be reacted with 2 equivalents of Grignard reagent to afford the tertiary alcohols III with R<sub>9</sub>=R<sub>10</sub>. Alternatively, for tertiary alcohols III with R<sub>9</sub> not equal to

$R_{10}$ , the corresponding Weinreb amide (see Scheme 7) of the N-sulfonyl acid can be prepared and subsequently reacted with  $R_9MgX$  and  $R_{10}MgX$ .

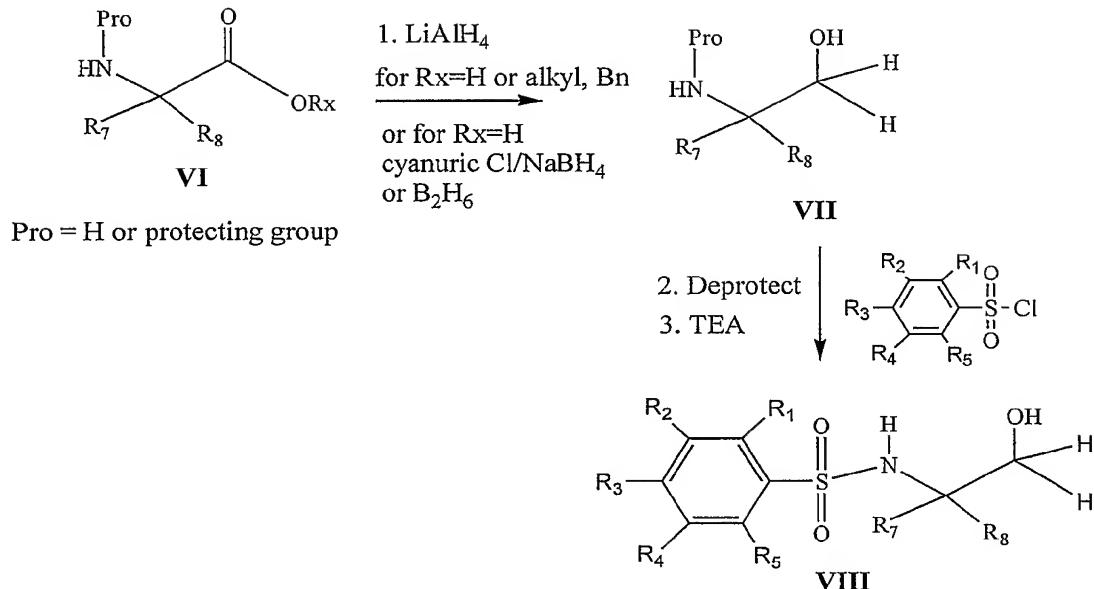
Scheme 2



5

In a variation of the second method to prepare the primary alcohols, an  $\alpha$ -amino acid or ester (or N-protected derivative thereof) VI is first converted to the corresponding primary 1,2-aminoalcohol VII (using the methodology outlined in the previous paragraph), which is subsequently, after deprotection (if necessary), reacted with the appropriate sulfonyl halide (Scheme 3) to afford compounds of formula VIII.

Scheme 3

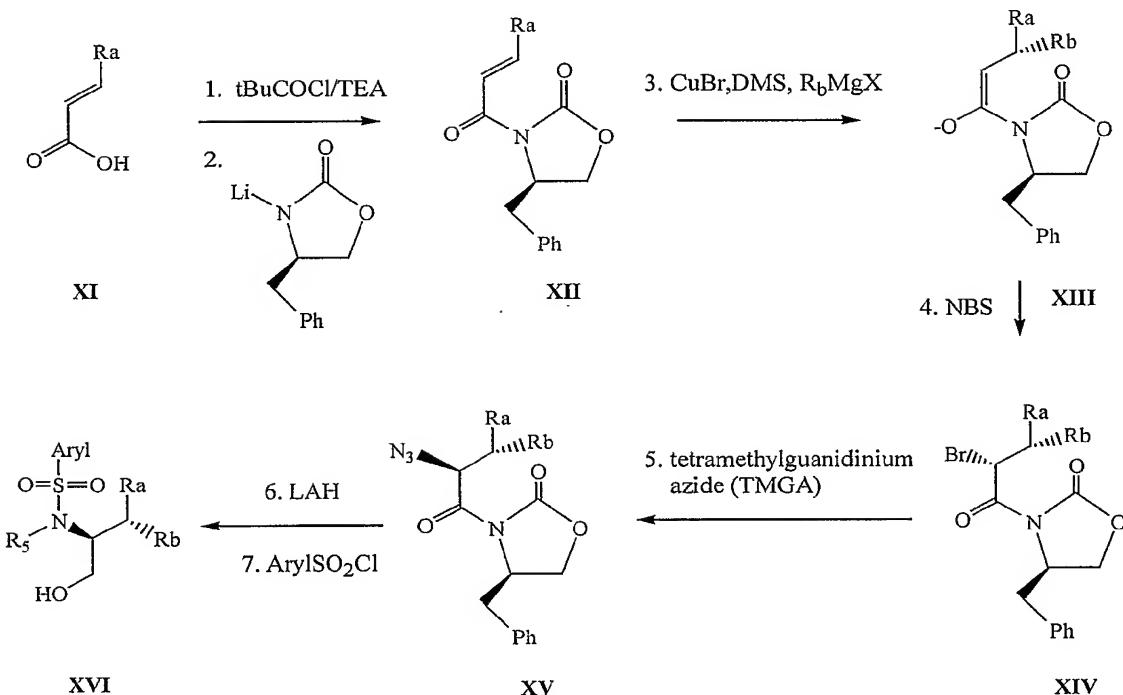


5

For the preparation of compounds derived from unnatural  $\alpha$ -amino acids containing beta branching in the amino acid side chain, a method of preparation based on the work of Hruby (Tet. Lett. 38: 5135-5138 (1997)), incorporated by reference, is outlined in Scheme 4. This route entails formation of the  $\alpha,\beta$ -unsaturated amide XII 10 of the Evans chiral auxiliary from an  $\alpha,\beta$ -unsaturated acid XI , followed by conjugate addition of an organocuprate, trapping of the resulting enolate anion XIII with N-bromosuccinimide (NBS), displacement of the bromide XIV with azide anion to afford XV, followed by reduction to the 1,2-aminoalcohol and subsequent sulfonylation to afford the target compound XVI.

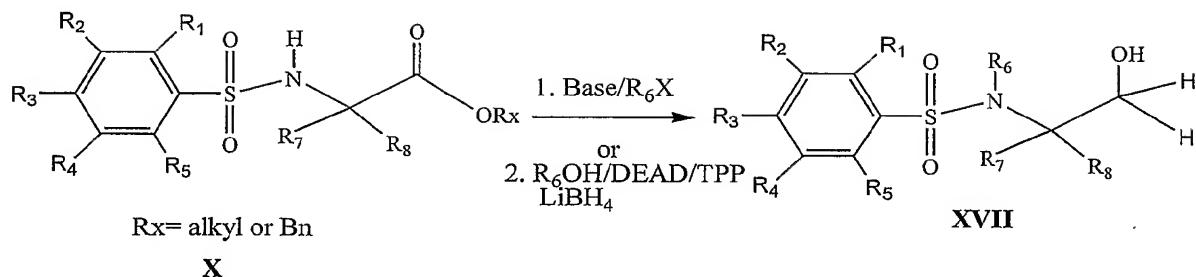
15

Scheme 4



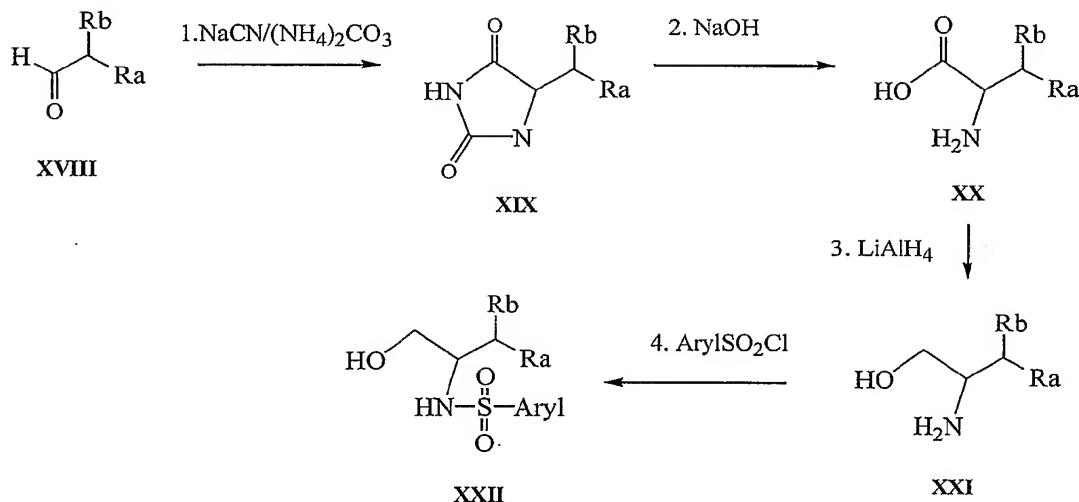
5        For the preparation of N-alkylated sulfonamides XVII ( $R_6$  can be alkyl, substituted alkyl, allyl, substituted allyl, benzyl, or substituted benzyl), the sulfonamide ester X can be N-alkylated by either treatment with a suitable base such as sodium hydride followed by the alkylating agent  $R_6X$  or by employing Mitsunobu conditions ( $R_6OH/DEAD$ , TPP).  $LiBH_4$  reduction of the N-alkylated sulfonamide ester affords the N-alkylated sulfonamide in the primary alcohol series XVII (Scheme 5). These primary alcohols XVII can be converted to N-alkylated analogs of the secondary alcohols V or aldehyde IV series by chemistry that has been outlined above. Alternatively, the N-alkylated sulfonamide esters, or their corresponding Weinreb amides, can be treated with Grignard reagents to afford the N-alkylated analogs of the tertiary alcohols III (where  $R_9$  and  $R_{10}$  are non-hydrogen).

10      15

**Scheme 5**

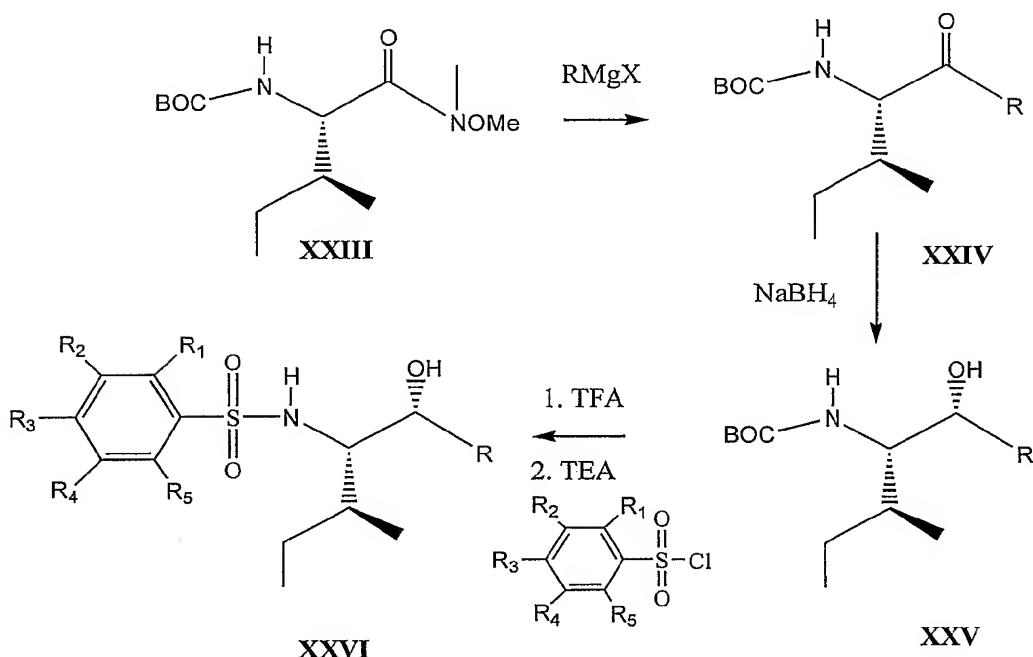
An alternate preparation of sulfonamides derived from unnatural 1,2-  
5 aminoalcohols utilizes the Bucherer modification of the Strecker  $\alpha$ -amino acid  
synthesis (Scheme 6). In this route, an aldehyde XVIII is reacted with cyanide anion  
and ammonium carbonate to afford the hydantoin XIX, which is hydrolyzed to the  $\alpha$ -  
amino acid XX. This compound is then reduced to XXI and sulfonylated to afford the  
desired compounds of formula XXII.

10

**Scheme 6**

As previously noted (Scheme 1), the preparation of sulfonamides derived from 1,2-aminoalcohols in the secondary alcohol series V results in the formation of a diastereomeric mixture. An alternate method of preparation of these compounds that results in the production of a pure diastereomer is outlined in Scheme 7 for 5 compounds derived from L-isoleucine. This method, which utilizes chemistry previously employed by Roux (Tetrahedron 50: 5345-5360 (1994)), consists of addition of Grignard reagents to the Weinreb amide XXIII (derived from the requisite  $\alpha$ -amino acid) followed by stereospecific reduction of the ketone XXIV to afford a single diastereomeric N-protected 1,2-aminoalcohol XXV. Deprotection of this 10 compound followed by reaction with sulfonyl chlorides affords the pure diastereomeric sulfonamide secondary alcohols of formula XXVI.

Scheme 7



15

Where catalysts or solvents are included in a reaction step of this invention, it is expected that other catalysts or solvents known in the art, but not mentioned herein, can be used. Those skilled in the art will readily be able to determine suitable

catalysts, solvents and reaction conditions for each reaction step included in the invention.

The invention includes certain types of reactions, such as enolate trapping, hydrolysis, and reduction reactions that are generally known in the art, but previously 5 had not been applied in the novel manner of the present invention. Variations in the specific methods of accomplishing individual steps of the invention can be apparent to those in the art. Although all of these possible variations cannot be set forth herein, such variations are contemplated to be within the scope of the present invention.

## 10 II. Formulations of the Invention

The compounds described herein can be formulated in any form suitable for the desired route of delivery using a pharmaceutically effective amount of one or more of the compounds of the invention. For example, the compositions of the invention can be delivered by a route such as oral, dermal, transdermal, 15 intrabronchial, intranasal, intravenous, intramuscular, subcutaneous, parenteral, intraperitoneal, sublingual, intracranial, epidural, intratracheal, intranasal, vaginal, rectal, or by sustained release. Preferably, delivery is oral.

A pharmaceutically effective amount of a compound used according to the present invention can vary depending on the specific compound, mode of delivery, 20 severity of the condition being treated, and any other active ingredients used in the formulation or the selected regimen. The dosing regimen can be adjusted to provide the optimal therapeutic response. Several divided doses can be delivered daily or a single daily dose can be delivered. The dose can however be proportionally reduced or increased as indicated by the exigencies of the therapeutic situation.

25 As described herein, a pharmaceutically useful amount of a compound of the invention is that amount of a compound which alleviates the symptoms of the disease, e.g., AD, or which prevents the onset of symptoms, or the onset of more severe symptoms. Generally, an individual dose (i.e., per unit, e.g., tablet) of a compound of the invention can be in the range from about 1  $\mu$ g/kg to about 10 g/kg, more 30 preferably 10 mg/kg to about 5 g/kg, and most preferably about 1 mg/kg to about 200 mg/kg. Desirably, these amounts are provided on a daily basis. However, the dosage to be used in the treatment or prevention of a specific cognitive deficit or other

condition can be subjectively determined by the attending physician. The variables involved include the specific cognitive deficit and the size, age and response pattern of the patient.

- The compounds of the invention can be combined with one or more
- 5 pharmaceutical acceptable carriers or excipients including, without limitation, solid and liquid carriers which are compatible with the compounds of the present invention. Such carriers can include adjuvants, syrups, elixirs, diluents, binders, lubricants, surfactants, granulating agents, disintegrating agents, emollients, solubilizers, suspending agents, fillers, glidants, compression aids, encapsulating materials,
- 10 emulsifiers, buffers, preservatives, thickening agents, colors, viscosity regulators, stabilizers, osmo-regulators, and combinations thereof. Optionally, one or more of the compounds of the invention can be mixed with other active agents.

- Adjuvants can include, without limitation, flavoring agents, sweeteners, coloring agents, preservatives, and supplemental antioxidants, which can include
- 15 vitamin E, ascorbic acid, butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA).

- Elixers and syrups can be prepared from acceptable sweeteners such as sugar, saccharine or a biological sweetener, a flavoring agent, and/or solvent. In one embodiment, a syrup can contain about 10 to about 50% of a sugar carrier. In another
- 20 embodiment, the elixir can contain about 20 to about 50% of an ethanol carrier.

- Diluents can include materials in which the compound can be dispersed, dissolved, or incorporated. Preferably, the diluents include water, lower monoalcohol, monohydric alcohols, polyhydric alcohols, and low molecular weight glycols and polyols, including propylene glycol, diethylene glycol, polyethylene glycol, polypropylene glycol, glycerol, butylene glycol, 1,2,4-butanetriol, sorbitol esters, 1,2,6-hexanetriol, ethanol, isopropanol, sorbitol esters, butanediol, ethyl oleate, isopropyl myristate, ether propanol, ethoxylated ethers, propoxylated ethers, oils such as corn, peanut, fractionated coconut, arachis, sesame oils, dimethylsulfoxide (DMSO), dimethylformamide (DMF), waxes, preferably low-melting waxes, dextrin, and combinations thereof. Preferably, the diluent is water.

Binders can include, without limitation, cellulose, methylcellulose, hydroxymethylcellulose, polypropylpyrrolidone, polyvinylpyrrolidone, polyvinylpyrrolidine, gelatin, gum arabic, polyethylene glycol, starch, sugars such as sucrose, kaolin, cellulose kaolin, and lactose, among others.

5 Lubricants can include magnesium stearate, light anhydrous silicic acid, talc and sodium lauryl sulfate, among others.

Granulating agents can include, without limitation, silicon dioxide, microcrystalline cellulose, starch, calcium carbonate, pectin, crospovidone, and polyplasdone, among others.

10 Disintegrating agents can include starch, carboxymethylcellulose, hydroxypropylstarch, substituted hydroxypropylcellulose, sodium bicarbonate, calcium phosphate, and calcium citrate, among others

15 Emollients can include, without limitation, stearyl alcohol, mink oil, cetyl alcohol, oleyl alcohol, isopropyl laurate, polyethylene glycol, olive oil, petroleum jelly, palmitic acid, oleic acid, and myristyl myristate.

Alternatively, the use of sustained delivery devices can be desirable, in order to avoid the necessity for the patient to take medications on a daily basis. The term "sustained delivery" is used herein to refer to delaying the release of an active agent, i.e., a compound of the invention, until after placement in a delivery environment, 20 followed by a sustained release of the agent at a later time. A number of sustained delivery devices are known in the art and include hydrogels (US Patent Nos. 5,266,325; 4,959,217; 5,292,515), osmotic pumps (US Patent Nos. 4,295,987 and 5,273,752 and European Patent No. 314,206, among others); hydrophobic membrane materials, such as ethylenemethacrylate (EMA) and ethylenevinylacetate (EVA); 25 bioresorbable polymer systems (International Patent Publication No. WO 98/44964 and US Patent Nos. 5,756,127 and 5,854,388); and other bioresorbable implant devices composed of, for example, polyesters, polyanhydrides, or lactic acid/glycolic acid copolymers (US Patent No. 5,817,343). For use in such sustained delivery devices, the compounds of the invention can be formulated as described herein.

### III. Formulation Delivery

The present invention provides methods of providing the compounds of the invention to a patient. The compounds can be delivered by a route such as oral, dermal, transdermal, intrabronchial, intranasal, intravenous, intramuscular, 5 subcutaneous, parenteral, intraperitoneal, sublingual, intracranial, epidural, intratracheal, intranasal, vaginal, rectal, or by sustained release. Preferably, delivery is oral.

In one embodiment, the compositions are delivered orally in solid or liquid form by powder, tablet, capsule, microcapsules, dispersible powder, granule, 10 suspension, syrup, elixir, and aerosol.

Desirably, when the compound is delivered orally, it is sub-divided in a dose containing appropriate quantities of the active ingredient. The unit dosage forms can be packaged compositions, for example packeted powders, vials, ampoules, prefilled syringes or sachets containing liquids. The unit dosage form can be, for example, a 15 capsule or tablet itself, or it can be the appropriate number of any such compositions in package form. Preferably, the powders and tablets contain up to 99% of the active ingredient.

In another embodiment, the compounds are delivered intravenously, intramuscularly, subcutaneously, parenterally and intraperitoneally in the form of 20 sterile injectable solutions, suspensions, dispersions, and powders which are fluid to the extent that easy syringe ability exists. Such injectable compositions are sterile, stable under conditions of manufacture and storage, and free of the contaminating action of microorganisms such as bacteria and fungi.

Injectable formations can be prepared by combining the compound with a 25 liquid. The liquid can be selected from among water, glycerol, ethanol, propylene glycol and polyethylene glycol, oils, and mixtures thereof, and more preferably the liquid carrier is water. In one embodiment, the oil is vegetable oil. Optionally, the liquid carrier contains about a suspending agent.

In a further embodiment, the compounds are delivered rectally or vaginally in 30 the form of a conventional suppository.

In yet another embodiment, the compositions are delivered intranasally or intrabronchially in the form of an aerosol.

- In a further embodiment, the compositions are delivered transdermally or by sustained release through the use of a transdermal patch containing the composition and an optional carrier that is inert to the compound, is nontoxic to the skin, and allows for delivery of the compound for systemic absorption into the blood stream.
- 5 Such a carrier can be a cream, ointment, paste, gel, or occlusive device. The creams and ointments can be viscous liquid or semisolid emulsions. Pastes can include absorptive powders dispersed in petroleum or hydrophilic petroleum. Further, a variety of occlusive devices can be utilized to release the active reagents into the blood stream and include semi-permeable membranes covering a reservoir contain the
- 10 active reagents, or a matrix containing the reactive reagents.

#### IV. Methods of Use

The compounds of the present invention have utility for the prevention and treatment of disorders involving beta amyloid production, including cerebrovascular diseases, and the prevention and treatment of AD by virtue of their ability to reduce beta amyloid production.

In preliminary studies using protease specific assays, the compounds of the invention have been shown to exhibit specific inhibition with respect to protease activity. Thus, the compounds of the present invention are useful for treatment and prevention of a variety of conditions in which modulation of beta amyloid levels provides a therapeutic benefit. Such conditions include, e.g., amyloid angiopathy, cerebral amyloid angiopathy, systemic amyloidosis, Alzheimer's Disease (AD), hereditary cerebral hemorrhage with amyloidosis of the Dutch type, inclusion body myositis, Down's syndrome and mild cognitive impairment, among others.

25 The compounds of the present invention have also been shown to inhibit beta amyloid production. In one embodiment, a subject or patient can be monitored for circulating levels of the compounds and/or beta-amyloid levels, from time to time following administration of a compound of the invention, or during the course of treatment. A variety of assays can be utilized for this purpose, including those

30 described below. Additionally, cellular, cell-free and in vivo screening methods, as well as radioimmunoassays and enzyme-linked immunosorbent assay (ELISA) to detect inhibitors of beta amyloid production are known in the art (See, e.g., P.D.

Mehta, et al., Techniques in Diagnostic Pathology, vol. 2, eds., Bullock et al, Academic Press, Boston, pages 99-112 (1991), International Patent Publication No. WO 98/22493, European Patent No. 0 652 009, and US Patent Nos. 5,703,129 and 5,593,846).

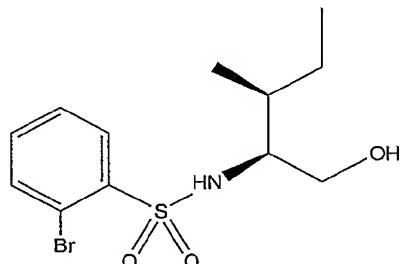
- 5       The compounds can further be utilized in generating reagents useful in diagnosis of conditions associated with abnormal levels of beta amyloid. For example, the compounds of Formula I can be used to generate antibodies which would be useful in a variety of diagnostic assays. Methods for generating monoclonal, polyclonal, recombinant, and synthetic antibodies or fragments thereof, 10 are well known to those of skill in the art. See, e.g., E. Mark and Padlin, "Humanization of Monoclonal Antibodies", Chapter 4, The Handbook of Experimental Pharmacology, Vol. 113, The Pharmacology of Monoclonal Antibodies, Springer-Verlag (June, 1994); Kohler and Milstein and the many known modifications thereof; International Patent Application No.
- 15      PCT/GB85/00392; British Patent Application Publication No. GB2188638A; Amit et al., Science, 233:747-753 (1986); Queen et al., Proc. Nat'l. Acad. Sci. USA, 86:10029-10033 (1989); International Patent Publication No. WO 90/07861; and Riechmann et al., Nature, 332:323-327 (1988); Huse et al, Science, 246:1275-1281 (1988). Alternatively, the compounds of Formula I can themselves be used in such 20 diagnostic assays. Regardless of the reagent selected (e.g., antibody or compound of Formula I), suitable diagnostic formats including, e.g., radioimmunoassays and enzyme-linked immunosorbent assays (ELISAs), are well known to those of skill in the art and are not a limitation on this embodiment of the invention.

The following examples are provided to illustrate the production and activity 25 of representative compounds of the invention and to illustrate their performance in a screening assay. One skilled in the art will appreciate that although specific reagents and conditions are outlined in the following examples, these reagents and conditions are not a limitation on the present invention.

## EXAMPLES

## Example 1

2-Bromo-N-[(1*S*,2*S*)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide



5

To a solution of (*S*) isoleucinol (23 mg, 0.2 mmol) in THF (3 mL) was added triethylamine (46  $\mu$ L, 0.24 mmol) and 2-bromobenzenesulfonyl chloride (51 mg, 0.2 mmol). The solution was stirred for 8 to 16 hours, then concentrated. The residue was dissolved in MeOH (1.5 mL) and purified by semi-preparative RP-HPLC using the following conditions:

Column: Phenomenex C18 Luna 21.6 mm x 60 mm, 5  $\mu$

Solvent A: Water (0.02% TFA buffer)

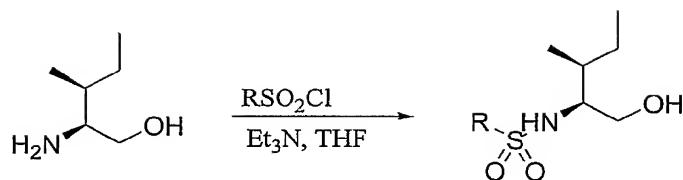
Solvent B: Acetonitrile (0.02 % TFA buffer)

Solvent Gradient: Time 0: 10 % B; 2.5 min: 10 % B; 14 min: 90 % B.

15 Flow Rate: 22.5 mL/min

The product peak was collected based on UV absorption and concentrated to give Example 1 (37.7 mg).

The following compounds (Table 1; Examples 1-13) were prepared using 2-bromobenzenesulfonyl chloride, 3-bromobenzenesulfonyl chloride, 3-chloro 20 benzenesulfonyl chloride, 4-chloro-7-chlorosulfonyl-2,1,3-benzoxadiazole, 2-chloro-4-fluorobenzenesulfonyl chloride, 5-chloro-2-methoxy-benzenesulfonyl chloride, 2-chloro-6-methylbenzenesulfonyl chloride, 3,5-dichlorobenzenesulfonyl chloride, 2,4-difluoro benzenesulfonyl chloride, 4-fluorobenzenesulfonyl chloride, 2-fluorobenzenesulfonyl chloride, 1-naphthalenesulfonyl chloride, and 2-naphthalenesulfonyl chloride and following the procedure outlined in Example 1. This procedure is outlined in the following Scheme.

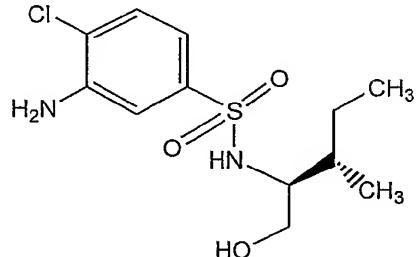
Table 1 - LCMS Data<sup>1</sup>

RSO <sub>2</sub> Cl	Example	Molecular ion and retention time
2-bromobenzenesulfonyl chloride	1	(338.0 M+H); 2.850 min
3-bromobenzenesulfonyl chloride	2	(338.0 M+H); 3.014 min
3-chlorobenzenesulfonyl chloride	3	(292.1 M+H); 2.949 min
4-chloro-7-chlorosulfonyl-2,1,3-benzoxadiazole	4	(334.1 M+H); 3.073 min
2-chloro-4-fluorobenzenesulfonyl chloride	5	(311.1 M+H); 2.910 min
5-chloro-2-methoxy-benzenesulfonyl chloride	6	(322.1 M+H); 3.018 min
2-chloro-6-methylbenzenesulfonyl chloride	7	(306.1 M+H); 3.017 min
3,5-dichlorobenzenesulfonyl chloride	8	(326.0 M+H); 3.320 min
2,4-difluorobenzenesulfonyl chloride	9	(294.1 M+H); 2.740 min
4-fluorobenzenesulfonyl chloride	10	(277.1 M+H); 2.691 min
2-fluorobenzenesulfonyl chloride	11	(276.1 M+H); 2.608 min
1-naphthalenesulfonyl chloride	12	(308.1 M+H); 3.087 min
2-naphthalenesulfonyl chloride	13	(308.1 M+H); 3.103 min

5      <sup>1</sup>LCMS conditions: Hewlett Packard 1100 MSD; YMC ODS-AM 2.0 mm x 50 mm 5  $\mu$  column at 23°C; 3  $\mu$ L injection; Solvent A: 0.02% TFA/water; Solvent B: 0.02% TFA/acetonitrile; Gradient: Time 0: 95% A; 0.3 min: 95% A; 4.7 min: 10% A; 4.9 min: 95% A. Flow rate 1.5 mL/min; Detection: 254 nm DAD; API-ES Scanning Mode Positive 150-700; Fragmentor 70 mV.

## Example 14

## 3-Amino-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide



5           A. Preparation of 3-Nitro-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide  
To a solution of S-isoleucinol (3.0 g, 25.6 mmol), triethylamine (2.85 g, 28.2 mmol) and methylene chloride (30 mL) at 0°C, was added a solution of 4-chloro-3-nitro-benzenesulfonyl chloride (6.55 g, 25.6 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (30 mL).

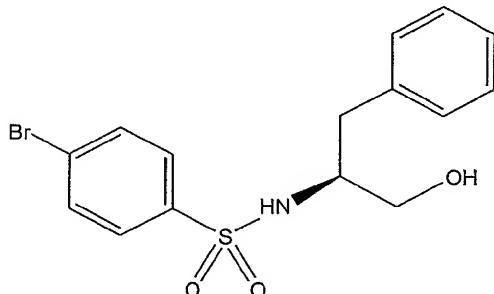
10          After 15 minutes, the ice bath was removed and the reaction allowed to reach 25°C. After 16 hours, the reaction was quenched by pouring into a saturated sodium bicarbonate solution (125 mL). The organic phase was separated and washed sequentially with 1N HCl solution (100 mL), distilled water and brine, dried over MgSO<sub>4</sub> and evaporated to give a crude solid that was recrystallized from ethyl acetate-hexane (5.52 g, 64%). MS (+ESI) 354 ([M+NH<sub>4</sub>]<sup>+</sup>). Anal. Calc'd for C<sub>12</sub>H<sub>17</sub>ClN<sub>2</sub>O<sub>5</sub>S: C, 42.80; H, 5.09; N, 8.32; Found: C, 42.82; H, 5.05; N, 8.23.

15          B. Preparation of 3-Amino-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide

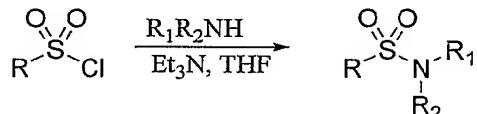
A standard hydrogenation bottle was charged with 3-nitro-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide (0.50g, 1.48 mmol), 10% palladium on carbon (0.05 g), methanol (25 mL) and hydrogen gas. It was shaken on a Parr hydrogenation apparatus for 50 minutes. The reaction mixture was filtered and the solvent evaporated to produce a crude oil that was flash chromatographed (eluent: ethyl acetate-hexane, 3-2) to afford the product as a solid, mp 89-92°C (0.12g, 26%). MS (+APCI) 307.03 ([M+H]<sup>+</sup>). Anal. Calc'd for C<sub>12</sub>H<sub>19</sub>ClN<sub>2</sub>O<sub>3</sub>S: C, 46.98; H, 6.24; N, 9.13; Found: C, 47.44; H, 6.32; N, 8.88.

## Example 15

N-[(1S)-1-benzyl-2-hydroxyethyl]-4-bromobenzenesulfonamide



To a solution of (S)-(-) 2-amino-3-phenyl-1-propanol (37 mg, 0.25 mmol) in THF (3 mL) was added triethylamine (58 uL, 0.3 mmol) and 4-bromobenzenesulfonyl chloride (63 mg, 0.25 mmol). The solution was stirred for 8 to 16 hours, then concentrated. The residue was dissolved in MeOH (1.5 mL) and purified by semi-preparative RP-HPLC using the conditions described in Example 1 to give Example 15 (9.8 mg). This procedure is outlined in the following Scheme.

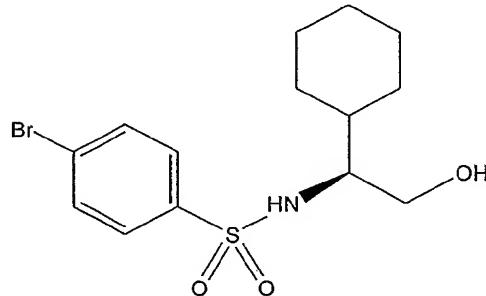


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Table 2 (LCMS Data<sup>1</sup>: Molecular ion and retention time)

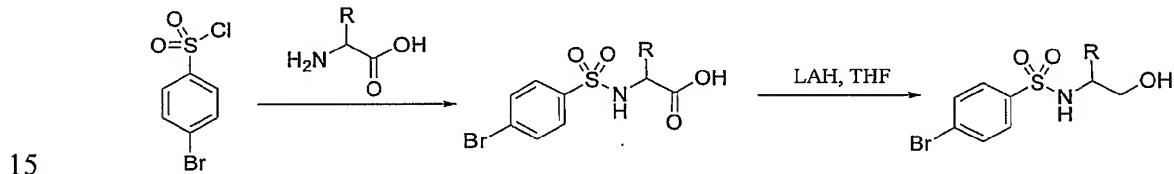
$\text{R}_1\text{R}_2\text{NH}$	
(S)-(-) 2-amino-3-phenyl-1-propanol	Example 15; (372.0 M+H); 3.110 min

## Example 16

4-Bromo-N-[(1*S*)-1-cyclohexyl-2-hydroxyethyl]benzenesulfonamide

To a solution of 4-bromobenzensulfonyl chloride (102 mg, 0.4 mmol) in THF (1 mL) was added L-cyclohexylglycine (77.4 mg, 0.4 mmol) in 1 N sodium hydroxide (1 mL). The reaction was shaken at 25°C for 16 hours, then concentrated.

The residue was dissolved in THF (1 mL) and lithium aluminum hydride (1 M solution in THF, 0.8 mmol, 0.8 mL) was added and the reaction shaken for 2 hours. Water (240  $\mu\text{L}$ ), 15% sodium hydroxide (240  $\mu\text{L}$ ) and water (960  $\mu\text{L}$ ) were added with shaking between each addition. The reaction mixture was filtered and the filtrate concentrated and purified as described for Example 1 to give Example 16 (1.9 mg). This procedure is outlined in the following Scheme.



The following compounds (Examples 16-19, Table 3) were prepared using 4-bromobenzensulfonyl chloride with L-cyclohexylglycine, D-4-hydroxyphenylglycine, D-methionine, and L-tryptophan and following the procedure outlined in Example 16.

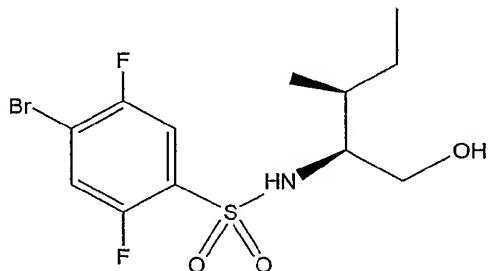
Table 3 (LCMS Data<sup>1</sup>: Molecular ion and retention time)

Amino Acid	Example	Molecular Ion	Retention time (min)
L-cyclohexylglycine	16	(364.0 M+H)	3.216
D-4-hydroxy phenylglycine	17	(374.0 M+H)	2.371
D-methionine	18	(355.0 M+H)	2.692
L-tryptophan	19	(411.0 M+H)	3.004

## Example 20

4-Bromo-2,5-difluoro-N-[(1S,2S)-1-(hydroxymethyl)-2methylbutyl]

5 benzenesulfonamide



To a solution of (S)-isoleucinol (23 mg, 0.2 mmol) in THF (3 mL) was added triethylamine (46 µL, 0.24 mmol) and 4-bromo-2,5-difluorobenzenesulfonyl chloride (58 mg, 0.2 mmol). The solution was stirred for 8 to 16 hours. The solvent was  
10 removed and the residue purified as described for Example 1 to give Example 20 (4.7 mg).

The following compounds (Table 4) were prepared using (S)-(+)-isoleucinol, (S)-(+)-2-amino-3-methyl-1-butanol, and (S)-tert-leucinol with 4-bromo-2,5-difluoro benzenesulfonyl chloride, 2,5-dibromobenzenesulfonyl chloride, 3,4-dibromo  
15 benzenesulfonyl chloride, 2,3-dichlorobenzenesulfonyl chloride, 3,4-dichloro benzenesulfonyl chloride, 2,4,5-trichlorobenzenesulfonyl chloride, and 2,4,6-trichloro benzenesulfonyl chloride and following the procedure outlined in Example 20.

This procedure is outlined in the following Scheme.

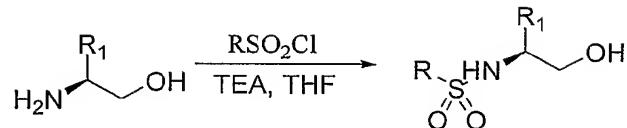
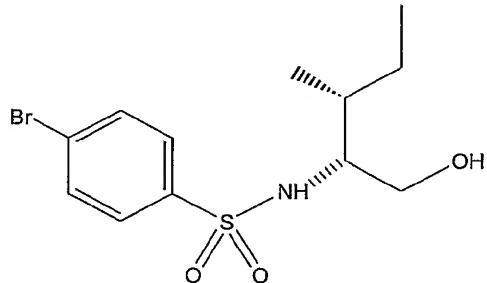


Table 4 (LCMS Data<sup>1</sup>: Molecular ion and retention time)

RSO <sub>2</sub> Cl	Aminoalcohol		
	(S)-(+)-isoleucinol	(S)-(+)-2-amino-3-methyl-1-butanol	(S)-tert-leucinol
4-bromo-2,5-difluorobenzenesulfonyl chloride	Ex. 20 (374.0 M+H); 3.663 min	Ex. 26 (358.0 M+H); 3.006 min	
2,5-dibromobenzenesulfonyl chloride	Ex. 21 (417.9 M+H); 3.340 min		
3,4-dibromobenzenesulfonyl chloride	Ex. 22 (415.9 M+H); 3.387 min		Ex. 29 (415.9 M+H); 3.357 min
2,3-dichlorobenzenesulfonyl chloride	Ex. 23 (328.0 M+H); 3.152 min		
3,4-dichlorobenzenesulfonyl chloride	Ex. 24 (328.0 M+H); 3.314 min	Ex. 27 (312.0 M+H); 3.105 min	Ex. 30 (326.0 M+H); 3.041 min
2,4,5-trichlorobenzenesulfonyl chloride	Ex. 25 (362.0 M+H); 3.533 min		Ex. 31 (362.0 M+H); 3.505 min
2,4,6-trichlorobenzenesulfonyl chloride		Ex. 28 (348.0 M+H); 3.210 min	Ex. 32 (362.0 M+H); 3.404 min

## Example 33

4-Bromo-N-[(1*R*,2*R*)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide



5 To a solution of D-isoleucine (32.8 mg, 0.25 mmol) in THF (2 mL) was added lithium aluminum hydride (1 M solution in THF) (0.8 mL, 0.8 mmol) and the solution was heated at 60°C for 4 hours. The solution was then stirred at 25°C for 8 to 16 hours. The reaction was quenched by addition of water (45 µL), 15% aqueous sodium hydroxide (45 µL) and water (105 µL) with vigorous stirring between each addition. The mixture was then filtered and concentrated.

To the residue in THF (3 mL) was added triethylamine (69 µL, 0.50 mmol) and 4-bromobenzenesulfonyl chloride (63.9 mg, 0.25 mmol). The solution was stirred for 8 to 16 hours, then concentrated and the residue purified as described for Example 1 to give 50.8 mg.

15 The following compounds (Examples 33-39, Table 5) were prepared using 4-bromobenzenesulfonyl chloride, and 4-chlorobenzenesulfonyl chloride, with D-isoleucine, L- $\alpha$ -methyl-valine,  $\beta$ -methyl-DL-phenylalanine, and L-allo-isoleucine and following the procedure outlined in Example 33. This procedure is outlined in the following Scheme.

20

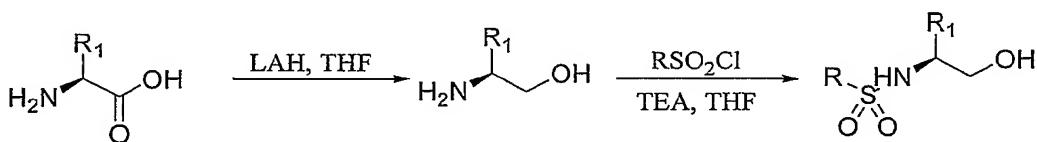


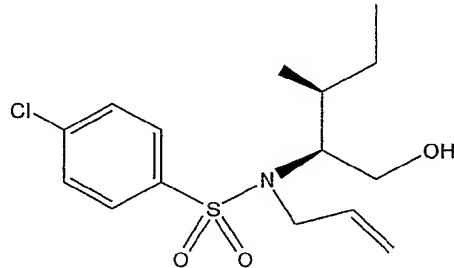
Table 5 (LCMS Data<sup>1</sup>: Molecular ion and retention time)

Amino Acid	RSO <sub>2</sub> Cl	
	4-bromobenzenesulfonyl chloride	4-chlorobenzenesulfonyl chloride
D-isoleucine	Ex. 33 (336.0 M+H); 2.858 min	
L- $\alpha$ -methyl-valine	Ex. 34 (338.0 M+H); 2.872 min	Ex. 37 (292.0 M+H); 2.806 min
$\beta$ -methyl-DL-phenylalanine	Ex. 35 (386.0 M+H); 3.089 min	Ex. 38 (342.0 M+H); 3.035 min
L-allo-isoleucine	Ex. 36 (336.0 M+H); 2.828 min	Ex. 39 (292.0 M+H); 2.763 min

## Example 40

N-Allyl-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide

5

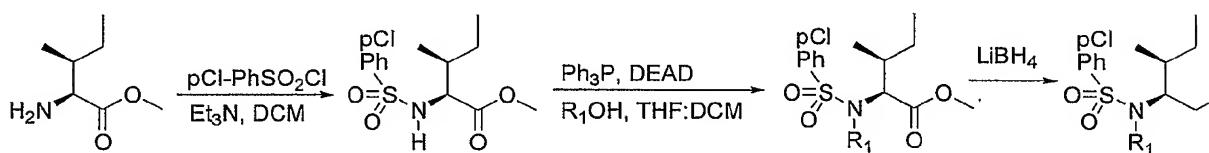


To a solution of L-isoleucine methyl ester hydrochloride (1.82 g, 10 mmol) and 4-chlorobenzenesulfonyl chloride (2.11 g, 10 mmol) in CH<sub>2</sub>Cl<sub>2</sub> was added triethylamine (4.18 mL, 30 mmol). The mixture was stirred at 25°C for 16 hours, then 10 filtered and concentrated. The crude product was purified by flash chromatography over silica gel using 10% ethyl acetate in hexane to give N-4-chlorobenzenesulfonyl L-isoleucine methyl ester 3.53 g.

To a solution of N-4-chlorobenzenesulfonyl L-isoleucine methyl ester (80 mg, 0.25 mmol) in a mixture of DCM (1.5 mL) and THF (1.5 mL) was added allyl alcohol 15 (17  $\mu$ L, 0.25 mmol), triphenylphosphine (66 mg, 0.25 mmol) and diethylazodicarboxylate (39  $\mu$ L, 0.25 mmol). The reaction was shaken at 25°C for 24 hours.

Lithium borohydride (11 mg, 0.5 mmol) was added to this reaction solution and the reaction was shaken at 45°C for 24 hours then quenched by addition of water (2 mL) and extracted into ethyl acetate (3.5 mL). The organic phase was evaporated and the residue purified as described for Example 1 to give 11.6 mg.

The following compounds (Examples 40-48, Table 6) were prepared using allyl alcohol, 4-biphenylmethanol, t-butyl N-(2-hydroxyethyl)-carbamate, p-chlorobenzyl alcohol, cyclobutanemethanol, 3,4-dimethoxybenzyl alcohol, furfuryl alcohol, 2-(methylthio)ethanol, and 3-phenyl-2-propyn-1-ol and following the procedure outlined in Example 40. This procedure is outlined in the following Scheme.



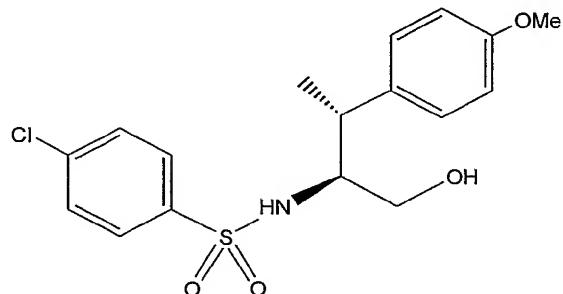
15

Table 6 (LCMS Data<sup>1</sup>)

R <sub>1</sub> OH	Example	Molecular Ion	Retention Time
allyl alcohol	40	332.24 M+H	3.57 min
4-biphenylmethanol	41	458.0 M+H	4.225 min
t-butyl N-(2-hydroxyethyl)-carbamate	42	435.33 M+H	3.68 min
p-chlorobenzyl alcohol	43	416.14 M+H	3.97 min
cyclobutanemethanol	44	360.31 M+H	3.97 min
3,4-dimethoxybenzyl alcohol	45	442.1 M+H	3.333 min
furfuryl alcohol	46	372.1 M+H	3.403 min
2-(methylthio)ethanol	47	366.27 M+H	3.69 min
3-phenyl-2-propyn-1-ol	48	406.33 M+H	4.05 min

## Example 49

4-Chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl)propyl]benzenesulfonamide



## 5 Part 1:

A solution of 2-pentenoic acid (4.05 mL, 40 mmol) in THF (100 mL) was cooled to -78°C. Triethylamine (5.85 mL, 42 mmol) and trimethylacetyl chloride (pivaloyl chloride) (5.17 mL, 42 mmol) were added via syringe in that order. The dry ice bath was replaced with an ice bath and the reaction stirred at 0°C for 1 hour, then 10 the reaction was recooled to -78°C. In a separate flask 4-(R)-4-benzyl-2-oxazolidinone (7.0 g, 40 mmol) was dissolved in THF (100 mL) and cooled to -78°C, then n-butyl lithium (1.6 M, 25 mL) was added via syringe. The mixture was stirred for 20 minutes then the above reaction mixture was added by removing the septum and pouring quickly from one flask to the other (Note\* attempts to transfer reaction 15 mixture via cannula failed due to the suspended triethylammonium chloride in the mixture).

The resulting mixture was stirred at -78°C for 30 minutes then allowed to warm to 25°C for 1 to 2 hours before quenching with saturated aqueous NH<sub>4</sub>Cl solution (100 mL). Volatiles were removed on the rotary evaporator and the aqueous slurry was diluted with water (200 mL) and extracted with ethyl acetate (2 x 200 mL). The combined organic phase was dried over MgSO<sub>4</sub>, filtered and concentrated. The product may crystallize out of solution and be of high purity. If purification is required, the crude product can be purified by flash chromatography using 20–30% ethyl acetate in hexane.

**Part 2:**

To a copper (I) bromide-dimethyl sulfide complex (246 mg, 1.2 mmol) in THF/DMS (2:1, 15 mL), cooled to -40° C, was added 4-methoxyphenyl magnesium bromide (4.8 mL 0.5 M solution in THF, 2.4 mmol). The solution was allowed to stir  
5 for 10 minutes while warming to -15° C. The mixture was recooled to -40° C and the product from Part 1 (245 mg, 1 mmol) in THF (6 mL) was added. The solution was stirred at 25°C for 8 to 16 hours. The solution was cooled to -78° C and N-bromosuccinimide (356 mg, 2 mmol) in THF (2 mL) was added. The solution was allowed to warm to 0° C and shaken at 0° C for 3 hours. The reaction was quenched  
10 with a 1:1 solution of saturated ammonium carbonate and 0.5 N potassium bisulfate (5 mL). The organic phase was decanted off and concentrated.

**Part 3:**

To the product from Part 2 dissolved in acetonitrile (5 mL) was added  
15 tetramethylguanidine azide (0.6 mL, 4 mmol). The solution was stirred for 72 to 120 hours. The solution was concentrated to dryness, redissolved in CH<sub>2</sub>Cl<sub>2</sub> and 1 N HCl (2 mL) was added. The layers were separated and the organic layer was filtered through a pad of silica gel, washed with CH<sub>2</sub>Cl<sub>2</sub> (5 mL) and concentrated.

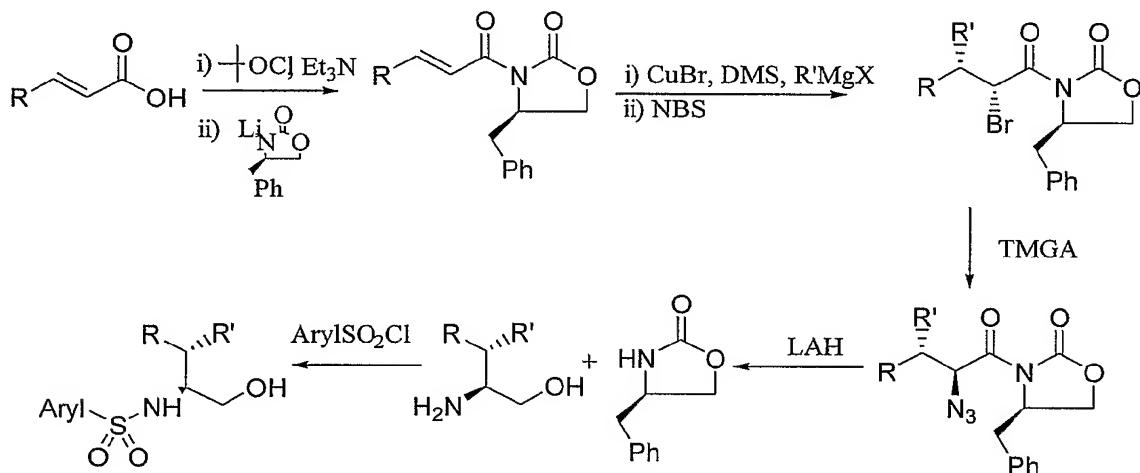
**20 Part 4:**

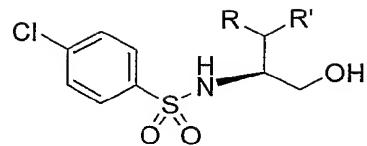
To the product from Part 3 (131 mg, 1 mmol) in THF (5 mL) at 0° C was added lithium aluminum hydride (1 M solution in THF) (2 mL, 2 mmol) and the solution stirred at 25°C for 4 hours. The reaction was quenched by addition of water (114 µL), 15% aqueous sodium hydroxide (114 µL), and water (266 µL) with  
25 vigorous stirring between each addition. The mixture was then filtered and concentrated.

## Part 5:

To the solution from Part 4 (0.5 mmol) in THF (2 mL) was added triethylamine (83.7  $\mu$ L, 0.6 mmol) and 4-chlorobenzenesulfonyl chloride (130.8 mg, 0.5 mmol). The solution was stirred for 8 to 16 hours, then concentrated. The solvent 5 was removed and the residue purified as described for Example 1 to give 50.8 mg.

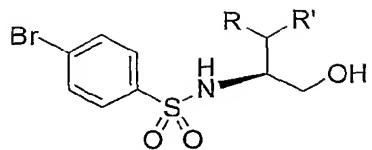
The following compounds (Examples 49-70, Table 7) were prepared using 4-chlorobenzenesulfonyl chloride with crotonic acid, 2-pentenoic acid, 2-hexenoic acid, 2-octenoic acid, cinnamic acid, furylacrylic acid, and 4-methyl-2-pentenoic acid and methyl, ethyl, isobutyl, 4-methoxyphenyl, hexyl and phenyl magnesium bromide and 10 following the procedure outlined in Example 49. This procedure is outlined in the following Scheme.



Table 7 (LCMS Data<sup>1</sup>: Molecular ion and retention time)

R	R'MgX					
	methyl	Ethyl	isobutyl	4-methoxyphenyl	n-hexyl	phenyl
Methyl				Ex. 49 (370.0 M+H); 3.168 min	Ex. 50 (348.1 M+H); 4.017 min	Ex. 51 (340.0 M+H); 3.244 min
Ethyl		Ex. 52 (306.0 M+H); 3.189 min	Ex. 53 (334.0 M+H); 3.648 min			
n-propyl	Ex. 54 (306.0 M+H); 3.215 min	Ex. 55 (320.0 M+H); 3.372 min	Ex. 56 (348.1 M+H); 3.891 min	Ex. 57 (398.1 M+H); 3.635 min	Ex. 58 (376.1 M+H); 4.415 min	Ex. 59 (368.1 M+H); 3.706 min
n-pentyl	Ex. 60 (334.1 M+H); 3.746 min	Ex. 61 (348.1 M+H); 3.949 min			Ex. 62 (404.2 M+H); 4.834 min	
Phenyl	Ex. 63 (340.0 M+H); 3.259 min		Ex. 64 (382.1 M+H); 3.876 min		Ex. 65 (410.1 M+H); 4.366 min	
2-furyl		Ex. 66 (344.0 M+H); 3.225 min	Ex. 67 (372.1 M+H); 3.649 min		Ex. 68 (400.1 M+H); 4.152 min	
i-propyl	Ex. 69 (306.0 M+H); 3.199 min				Ex. 70 (376.1 M+H); 4.414 min	

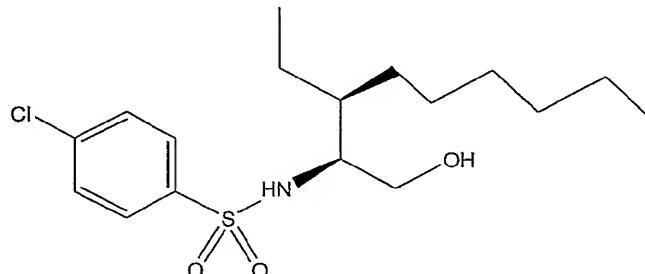
The following compounds (Examples 71-87, Table 8) were prepared using 4-bromobenzenesulfonyl chloride with crotonic acid, 2-pentenoic acid, 2-hexenoic acid, 2-octenoic acid, cinnamic acid, *b*-(3-pyridyl)-acrylic acid, furylacrylic acid, and 4-methyl-2-pentenoic acid and methyl, ethyl, isobutyl, 4-methoxyphenyl, and hexyl magnesium bromide and following the procedure outlined in Example 49.

Table 8 (LCMS Data<sup>1</sup>: Molecular ion and retention time)

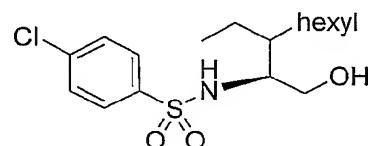
R	R'				
	Methyl	ethyl	Isobutyl	4-methoxy-phenyl	n-hexyl
Methyl				Ex. 71 (414.0 M+H); 3.230 min	Ex. 72 (394.0 M+H); 4.071 min
Ethyl			Ex. 73 (380.0 M+H); 3.710 min	Ex. 74 (430.0 M+H); 3.460 min	Ex. 75 (406.1 M+H); 4.256 min
n-propyl	Ex. 76 (352.0 M+H); 3.291 min	Ex. 77 (364.0 M+H); 3.422 min	Ex. 78 (394.0 M+H); 3.949 min		Ex. 79 (422.1 M+H); 4.466 min
n-pentyl	Ex. 80 (380.0 M+H); 3.797 min	Ex. 81 (392.1 M+H); 4.007 min			
Phenyl	Ex. 82 (386.0 M+H); 3.328 min	Ex. 83 (398.0 M+H); 3.546 min			
2-furyl	Ex. 84 (376.0 M+H); 3.057 min	Ex. 85 (388.0 M+H); 3.305 min	Ex. 86 (418.0 M+H); 3.712 min		
i-propyl			Ex. 87 (394.0 M+H); 3.948 min		

## Example 88

## 4-Chloro-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)octyl]benzenesulfonamide



Following the procedure outlined in Example 49 (Part 1 and 2), 2-pentenoic acid was coupled with 4-(R)-4-benzyl-2-oxazolidinone to give (R)-3-(2'-pentenyl)-4-benzyl-2-oxazolidinone. Addition of hexyl magnesium bromide was followed by trapping by N-bromosuccinimide. After workup, flash chromatography over silica gel using 5% ether in hexane, gave approximately a 2:1 mixture of (1R-2S):(1R-2S)-3-(2'-bromo-3'ethylnonanyl)-4-benzyl-2-oxazolidinone. Each isomer was converted to the corresponding sulfonylated amino alcohol following the procedure in Example 49, (Steps 3-5).



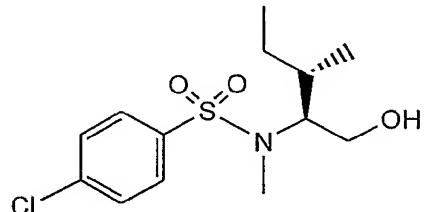
15

Table 9 (LCMS Data<sup>1</sup>: Molecular ion and retention time)

Isomer	Example	Molecular Ion	Retention Time (min)
1S-2S	88	363 M+H	4.24 min
1S-2R	89	363 M+H	4.24 min

## Example 90

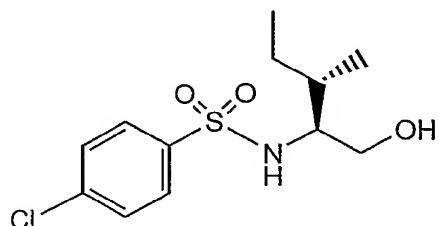
4-Chloro- N-methyl-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide



5 To a solution of 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide (0.10 g, 0.343 mmol) dissolved in DMF (2.0 mL) was added potassium carbonate (47 mg, 0.343 mmol). After 30 minutes, the reaction mixture was cooled to 0°C and iodomethane (50 µL, 0.686 mmol) was added. After 2 hours, the ice bath was removed and the reaction mixture was stirred at 25°C for 24 hours. The  
10 insolubles were then filtered off and the DMF solution was diluted with EtOAc (50 mL) and washed sequentially with 10% citric acid (50 mL) and saturated brine (50 mL), dried over MgSO<sub>4</sub> and evaporated to a clear oil which was washed with Et<sub>2</sub>O and then purified by flash chromatography (eluant: 95-5 CHCl<sub>3</sub>/iPrOH) to afford the desired product as a clear oil (71 mg, 68%). Mass Spectrum (+APCI): 306 ([M+H]<sup>+</sup>).  
15 Anal: Calc'd for C<sub>13</sub>H<sub>20</sub>ClNO<sub>3</sub>S: C, 51.06; H, 6.59; N, 4.58. Found: C, 51.15; H, 6.73; N, 4.36.

## Example 91

4-Chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide

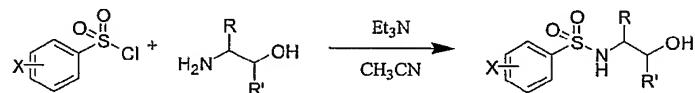


20

To a solution of (S)-isoleucinol (17.6 mg, 0.15 mmol) in CH<sub>3</sub>CN (600 µL) was added Et<sub>3</sub>N (300 µL, 1M in CH<sub>3</sub>CN) and 4-chlorobenzenesulfonyl chloride (21.07 mg, 0.1 mmol) as a solution in CH<sub>3</sub>CN (400 µL). The vial was capped and

shaken for 8 to 12 hours at 40 °C. The solvent was removed, and the oil was dissolved in EtOAc (1 mL). The resulting solution was washed with 1M HCl (2 x 1mL). The solvent was removed in vacuo, and the residue dissolved in 1.6 mL DMSO (0.03 M).

The following compounds (Examples 91-119, Table 10) were prepared using  
 5 4-chloro, 4-bromo, 3-chloro, and 3-fluorobenzenesulfonyl chloride with (S)-  
 isoleucinol, L-leucinol, DL-2-amino-1-hexanol, (1S, 2R)-(+)-phenyl-propanolamine,  
 (S)-(+)-2-phenylglycinol, (R)-(-)-leucinol, 1-amino-1-cyclopentanemethanol, DL-2-  
 amino-1-pentanol, (S)-2-amino-3-cyclohexyl-1-propanol, H-tyrosinol(bzl), (R)-(+)-  
 methioninol, (S)-(+)-2-amino-1-butanol, (1S,2S)-(+)-thiomicamine, L-alaninol, L-  
 10 phenylalaninol, L-valinol, and (R)-(+)-2-amino-2-methyl-1-butanol following the  
 procedure outlined in Example 91. This procedure is outlined in the following  
 Scheme.



15

Table 10 (LCMS Data<sup>2</sup>: Molecular ion and retention time)

Aminoalcohol	X-Ph			
	4-chloro-Ph	4-bromo-Ph	3-chloro-Ph	3-fluoro-Ph
(S)-isoleucinol	Ex. 91 290.54 (M-H) 0.96 min	Ex. 98 334.48 (M-H) 1.00 min		
L-leucinol	Ex. 92 290.53 (M-H) 0.96 min			Ex. 109 274.57 (M-H) 0.87 min
DL-2-amino-1-hexanol		Ex. 99 334.49 (M-H) 1.02 min		Ex. 110 274.55 (M-H) 0.86 min
(1S,2R)-(+)-phenyl-propanolamine	Ex. 93 324.54 (M-H) 1.05 min	Ex. 100 368.44 (M-H) 1.09 min		Ex. 111 308.55 (M-H) 0.96 min

Table 10 (cont'd)

Aminoalcohol	X-Ph			
	4-chloro-Ph	4-bromo-Ph	3-chloro-Ph	3-fluoro-Ph
(S)-(+)-2-phenylglycinol		Ex. 101 354.44 (M-H) 0.96 min		Ex. 112 294.53 (M-H) 0.81 min
(R)-(-)-leucinol		Ex. 102 334.48 (M-H) 1.00 min		Ex. 113 274.48 (M-H) 0.89 min
1-amino-1-cyclopentane methanol	Ex. 94 332.47 (M-H) 0.95 min	Ex. 103 288.52 (M-H) 0.91 min		Ex. 114 272.55 (M-H) 0.78 min
DL-2-amino-1-pentanol		Ex. 104 320.47 (M-H) 0.93 min	Ex. 105 276.49 (M-H) 0.89 min	
(S)-2-amino-3-cyclohexyl-1-propanol	Ex. 95 330.57 (M-H) 1.16 min		Ex. 106 330.57 (M-H) 1.16 min	Ex. 115 314.59 (M-H) 1.07 min
H-tyrosinol (bzl)	Ex. 96 430.54 (M-H) 1.22 min			
(R)-(+)-methioninol			Ex. 107 308.50 (M-H) 0.85 min	
(S)-(+)-2-amino-1-butanol			Ex. 108 262.49 (M-H) 0.80 min	
(1S,2S)-(+)-thiomicamine				Ex. 116 370.51 (M-H) 0.85 min
L-alaninol				Ex. 117 232.47 (M-H) 0.52 min
L-phenyl alaninol				Ex. 118 308.56 (M-H) 0.89 min
L-valinol				Ex. 119 260.51 (M-H) 0.74 min

Table 10 (cont'd)

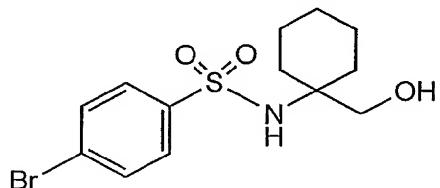
Aminoalcohol	X-Ph			
	4-chloro-Ph	4-bromo-Ph	3-chloro-Ph	3-fluoro-Ph
(R)-(+)-2-amino-2-methyl-1-butanol	Ex. 97 275.91 (M-H) 0.49 min			

<sup>2</sup>LCMS conditions: ZMD (Waters) or Platform (Micromass) or LCZ (Micromass); column: Zorbax SB-C8; solvent: AcCN+H<sub>2</sub>O containing 0.1% TFA or 0.1% FA; gradient: 2.5 min 15% AcCN-95% AcCN; flow rate: 3 mL/min; detection: ELSD detection (SEDEX 55); UV253 detection (Schimadzu).

5

## Example 120

## 4-Bromo-N-[1-(hydroxymethyl)-cyclohexyl]-benzenesulfonamide



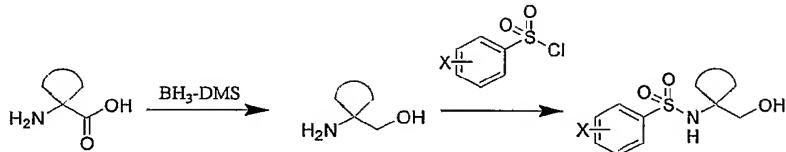
## Part 1:

- 10 To a suspension of 1-amino-1-cyclohexane carboxylic acid (5 g, 35 mmol) and THF (100 mL) was added borane dimethyl sulfide (50 mL, 2M in THF) at 0 °C. The cold bath was allowed to expire and the reaction was stirred at 25 °C for 24 hours. NaOH (3M, 100 mL) was added and the mixture was stirred for 4 hours. The reaction mixture was saturated with K<sub>2</sub>CO<sub>3</sub> and extracted with Et<sub>2</sub>O (2 x 100 mL). The combined organic extracts were washed with brine (100 mL) and dried over MgSO<sub>4</sub> and evaporated to give 4.35 g (96%) of the desired amino alcohol.
- 15

## Part 2:

- The amino alcohol was sulfonylated as in example 91.
- 20 The following compounds (Examples 120-125, Table 11) were prepared using the following amino acids: 1-amino-1-cyclohexane carboxylic acid, 2-amino-2-norbornane carboxylic acid, d, l-1-aminoindane-1-carboxylic acid, and d-l-2-cyclobutyl-2-phenylglycine with 4-bromo and 4-chlorobenzenesulfonyl chloride

following the procedure outlined for example 120. This procedure is outlined in the following Scheme.

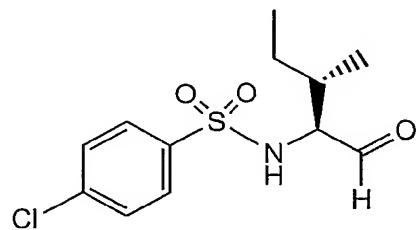


5

Table 11 (LCMS Data<sup>2</sup>: Molecular ion and retention time)

Amino Acid	X-Ph	
	4-bromo-Ph	4-chloro-Ph
1-amino-1-cyclohexane carboxylic acid	Example 120 348.07 (M-H) 1.02 min	Example 123 302.18 (M-H) 1.00 min
2-amino-2-norbornane carboxylic acid	Example 121 360.05 (M-H) 1.07 min	
d,l-1-aminoindane-1-carboxylic acid	Example 122 381.96 (M-H) 1.06 min	Example 124 336.17 (M-H) 1.04 min
d,l-2-cyclobutyl-2-phenylglycine		Example 125 364.21 (M-H) 1.22 min

## Example 165A

4-Chloro-N-[(1*S*,2*S*)-1-formyl-2-methylbutyl]benzenesulfonamide

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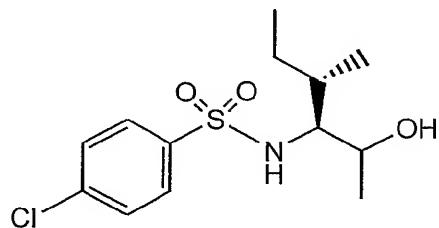
To a solution of 4-chlorobenzenesulfonyl chloride (1.93 g, 9.1 mmol) in CH<sub>3</sub>CN (25 mL) and (S)-isoleucinol (1.07 g, 9.1 mmol) was added Et<sub>3</sub>N (1.91 mL, 13.7 mmol). The reaction mixture was stirred at 25 °C for 30 minutes. The solvent was removed and the oil was dissolved in CH<sub>2</sub>Cl<sub>2</sub> (20 mL). The solution was washed with water (2 x 20 mL) and dried over Na<sub>2</sub>SO<sub>4</sub>. The solvent was removed to give N-4-chloro benzenesulfonyl isoleucinol, which was carried on without further purification.

To a stirred solution of N-4-chlorobenzenesulfonyl isoleucinol (~9.1 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (100 mL) was added a mixture of pyridinium chlorochromate (5.88 g, 27.3 mmol) and silica gel (~6 g). The resulting slurry was stirred at 25 °C until the alcohol was consumed by TLC analysis. The reaction mixture was diluted with Et<sub>2</sub>O (250 mL) and filtered through wet silica gel (eluant: 20% EtOAc/ hex). Following removal of solvent, the residue was subjected to a Biotage™ eluting with 10→20% EtOAc/hex to give 1.94 g (74%, two steps) of the aldehyde (LCMS = 288.14 (M-H), rt = 1.07 min).

10

## Example 165

4-Chloro-N-[(1S,2S)-1-(hydroxyethyl)-2-methylbutyl]benzenesulfonamide

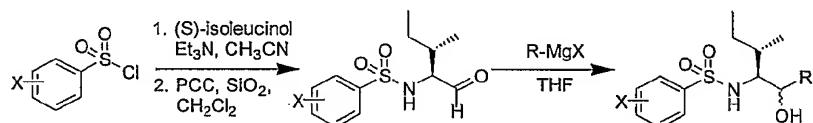


To a solution of the aldehyde from Example 165A (23.1 mg, 80 mmol) in THF (400 μL) was added methyl magnesium bromide (400 μL, 1.0 M in THF, 5 eq).

15 The vial was capped and agitated at 50 °C for 12 hours. The reaction was quenched with saturated aqueous NH<sub>4</sub>Cl (1.5 mL) and EtOAc (1 mL). The organic layer was transferred into a tared vial and the aqueous layer was extracted with EtOAc (1 mL). The combined organics were concentrated (Savant, medium heat) and the resulting mixture of diastereomers was dissolved in DMSO such that the final concentration 20 was 30 mM.

The following compounds (Examples 126-210, Table 12) were prepared using N-4-fluoro, 4-bromo, 4-chloro, 3-chloro and 2-fluorophenylsulfonyl isoleucinal with methylmagnesium bromide, cyclopentylmagnesium bromide, hexylmagnesium bromide, pentylmagnesium bromide, butylmagnesium bromide, isopropylmagnesium bromide, o-tolylmagnesium bromide, tert-butylmagnesium bromide, isobutylmagnesium bromide, vinylmagnesium bromide, allylmagnesium bromide, ethylmagnesium bromide, 4-fluorophenylmagnesium bromide, 4-

- chlorophenylmagnesium bromide, 2-methyl-1-propenylmagnesium bromide, isopropenylmagnesium bromide, 4-anisylmagnesium bromide, 1-methyl-1-propenylmagnesium bromide, 2-[2-(1,3-dioxanyl)]ethylmagnesium bromide, 3-but enylmagnesium bromide, 1-propynylmagnesium bromide, 4-thioanisolemagnesium bromide, 4-N,N-dimethylanilinemagnesium bromide, and 1-naphthylmagnesium bromide following the procedures outlined in examples 165A and 165. This procedure is outlined in the following Scheme.



10

Table 12 (LCMS Data<sup>2</sup>: Molecular ion and retention time(s))

RMgX	X-Ph				
	4-fluoro-Ph	4-bromo-Ph	4-chloro-Ph	3-chloro-Ph	2-fluoro-Ph
Methyl magnesium bromide	Ex. 126 288.18 (M-H) 1.01 min	Ex. 145 350.05 (M-H) 1.12 min	Ex. 165 304.10 (M-H) 1.04 min, 1.10 min	Ex. 185 304.15 (M-H) 1.05 min, 1.12 min	
Cyclopentyl magnesium bromide	Ex. 127 242.21 (M-H) 1.30 min	Ex. 146 404.05 (M-H) 1.40 min	Ex. 166 358.18 (M-H) 1.37 min	Ex. 186 358.18 (M-H) 1.39 min	Ex. 202 342.22 (M-H) 1.29 min
Hexyl magnesium bromide	Ex. 128 358.24 (M-H), 1.40 min, 1.44 min		Ex. 167 374.21 (M-H) 1.48 min, 1.52 min	Ex. 187 374.22 (M-H) 1.48 min, 1.53 min	Ex. 203 358.24 (M-H) 1.41 min, 1.46 min
Pentyl magnesium bromide	Ex. 129 344.23 (M-H) 1.32 min, 1.36 min	Ex. 147 406.10 (M-H), 1.40 min, 1.46 min	Ex. 168 360.19 (M-H) 1.40 min, 1.45 min	Ex. 188 360.20 (M-H) 1.40 min, 1.46 min	Ex. 204 344.22 (M-H) 1.32 min, 1.36 min
Butyl magnesium bromide	Ex. 130 330.21 (M-H) 1.24 min, 1.28 min	Ex. 148 392.07 (M-H), 1.34 min, 1.39 min	Ex. 169 346.18 (M-H) 1.33 min, 1.37 min	Ex. 189 346.17 (M-H) 1.33 min, 1.38 min	Ex. 205 330.23 (M-H) 1.25 min, 1.30 min

Table 12 (cont'd)

RMgX	X-Ph				
	4-fluoro-Ph	4-bromo-Ph	4-chloro-Ph	3-chloro-Ph	2-fluoro-Ph
Isopropyl magnesium bromide			Ex. 170 332.17 (M-H) 1.25 min, 1.30 min	Ex. 190 332.18 (M-H) 1.26 min, 1.31 min	
o-tolyl magnesium bromide	Ex. 131 364.19 (M-H) 1.28 min		Ex. 171 380.17 (M-H) 1.36 min		
tert-butyl magnesium bromide	Ex. 132 330.21 (M-H) 1.31 min	Ex. 149 392.08 (M-H) 1.42 min	Ex. 172 346.17 (M-H) 1.40 min	Ex. 191 346.18 (M-H) 1.40 min	
Isobutyl magnesium bromide		Ex. 150 392.06 (M-H) 1.33 min, 1.37 min	Ex. 173 346.17 (M-H) 1.31 min, 1.36 min	Ex. 192 346.18 (M-H) 1.32 min, 1.37 min	
Vinyl magnesium bromide	Ex. 133 300.18 (M-H) 1.04 min, 1.08 min	Ex. 151 362.07 (M-H) 1.16 min, 1.20 min	Ex. 174 316.14 (M-H) 1.13 min, 1.17 min	Ex. 193 316.16 (M-H) 1.13 min, 1.18 min	Ex. 206 300.18 (M-H) 1.03 min, 1.08 min
Allyl magnesium bromide	Ex. 134 314.19 (M-H) 1.12 min, 1.16 min	Ex. 152 376.05 (M-H) 1.22 min, 1.26 min	Ex. 175 330.14 (M-H) 1.21 min, 1.25 min	Ex. 194 330.17 (M-H) 1.20 min, 1.25 min	
Ethyl magnesium bromide	Ex. 135 302.19 (M-H) 1.06 min, 1.11 min	Ex. 153 364.09 (M-H) 1.18 min, 1.23 min	Ex. 176 318.16 (M-H) 1.16 min, 1.21 min	Ex. 195 318.16 (M-H) 1.16 min, 1.21 min	
4-fluoro phenyl magnesium bromide		Ex. 154 429.99 (M-H) 1.28 min, 1.33 min			Ex. 207 368.17 (M-H) 1.18 min, 1.23 min
4-chloro phenyl magnesium bromide	Ex. 136 384.14 (M-H) 1.26 min, 1.30 min	Ex. 155 446.01 (M-H) 1.35 min, 1.40 min	Ex. 177 402.03 (M-H) 1.33 min, 1.35 min	Ex. 196 402.06 (M-H) 1.33 min, 1.38 min	Ex. 208 384.14 (M-H) 1.25 min, 1.30 min

Table 12 (cont'd)

RMgX	X-Ph				
	4-fluoro-Ph	4-bromo-Ph	4-chloro-Ph	3-chloro-Ph	2-fluoro-Ph
2-methyl-1-propenyl magnesium bromide	Ex. 137 238.18 (M-H) 1.16 min, 1.21 min	Ex. 156 390.04 (M-H) 1.25 min, 1.31 min		Ex. 197 344.19 (M-H) 1.24 min, 1.30 min	
Isopropenyl magnesium bromide	Ex. 138 314.19 (M-H) 1.14 min, 1.17 min	Ex. 157 376.06 (M-H) 1.24 min, 1.28 min			
4-anisyl magnesium bromide	Ex. 139 380.20 (M-H) 1.15 min, 1.21 min	Ex. 158 442.01 (M-H) 1.24 min, 1.30 min	Ex. 178 396.16 (M-H) 1.23 min, 1.29 min	Ex. 198 396.19 (M-H) 1.22 min, 1.28 min	Ex. 209 380.20 (M-H) 1.14 min, 1.19 min
1-methyl-1-propenyl magnesium bromide		Ex. 159 390.03 (M-H) 1.26 min, 1.35 min			
2-[2-(1,3-dioxanyl)] ethyl magnesium bromide	Ex. 140 388.22 (M-H) 0.99 min, 1.04 min	Ex. 160 450.07 (M-H) 1.09 min, 1.15 min	Ex. 179 404.18 (M-H) 1.08 min, 1.13 min	Ex. 199 404.19 (M-H) 1.13 min	Ex. 210 388.21 (M-H) 0.98 min, 1.03 min
3-butenyl magnesium bromide	Ex. 141 328.21 (M-H) 1.19 min, 1.23 min	Ex. 161 390.06 (M-H) 1.29 min, 1.33 min	Ex. 180 344.16 (M-H) 1.27 min, 1.31 min	Ex. 200 344.16 (M-H) 1.27 min, 1.31 min	
1-propynyl magnesium bromide		Ex. 162 374.01 (M-H) 1.19 min	Ex. 181 328.15 (M-H) 1.18 min		
4-thio anisole magnesium bromide	Ex. 142 396.17 (M-H) 1.25 min, 1.29 min	Ex. 163 458.01 (M-H) 1.33 min, 1.38 min	Ex. 182 412.14 (M-H) 1.32 min, 1.37 min	Ex. 201 412.15 (M-H) 1.32 min, 1.37 min	

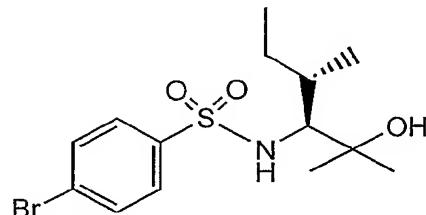
Table 12 (cont'd)

RMgX	X-Ph				
	4-fluoro-Ph	4-bromo-Ph	4-chloro-Ph	3-chloro-Ph	2-fluoro-Ph
4-N,N-dimethyl aniline magnesium bromide	Ex. 143 393.24 (M-H) 0.77 min, 0.81 min	Ex. 164 455.07 (M-H) 0.95 min	Ex. 183 409.22 (M-H) 0.92 min		
1-naphthyl magnesium bromide	Ex. 144 400.21 (M-H) 1.35 min		Ex. 184 416.18 (M-H) 1.41 min		

## Example 211

4-Bromo-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-ethylbutyl]benzenesulfonamide

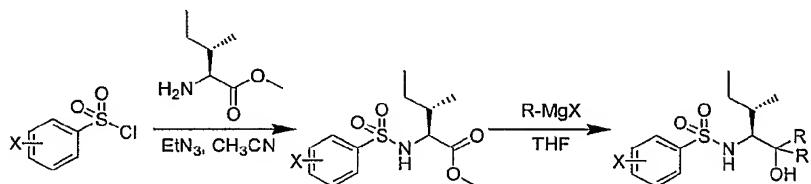
5 Part 1:



To a solution of 4-bromobenzenesulfonyl chloride (1.278 g, 5 mmol) in CH<sub>3</sub>CN (20 mL) was added (L)-isoleucine methyl ester hydrochloride (908.5 mg, 5 mmol) as a solution in CH<sub>3</sub>CN (10 mL) and Et<sub>3</sub>N (1 mL, 7.2 mmol). The reaction mixture was heated at 50 °C with shaking for 3 days. The solvent was removed and 10 the oil was dissolved in EtOAc (10 mL). The solution was washed with water (5 mL), sat. NH<sub>4</sub>OH (5 mL), brine (5 mL), and dried over MgSO<sub>4</sub>. The solvent was removed to give 1.62 g (89%) of the desired sulfonamide ester.

To a solution of the sulfonamide ester (45.5 mg, 0.125 mmol) in THF (500 µL) was added methyl magnesium bromide (333 µL, 3.0 M in THF, 8 eq). The vial 15 was capped and agitated at 50 °C for 12 hours. The reaction was quenched with saturated NH<sub>4</sub>Cl (1.5 mL) and EtOAc (1 mL). The organic layer was transferred into a tared vial and the aqueous layer was extracted with EtOAc (1 mL). The combined organic extract was concentrated (Savant, medium heat) and the product was dissolved in DMSO such that the final concentration was 30 mM.

The following compounds (Examples 211-271, Table 13) were prepared using (from part 2) N-4-bromo, 4-chloro, 4-fluoro, 3-chloro and 2-fluorobenzenesulfonyl isoleucine methyl ester with methylmagnesium bromide, hexylmagnesium bromide, pentylmagnesium bromide, butylmagnesium bromide, isopropylmagnesium bromide, 5 isobutylmagnesium bromide, allylmagnesium bromide, ethylmagnesium bromide, 4-fluorophenylmagnesium bromide, 4-chlorophenylmagnesium bromide, 2-methyl-1-propenylmagnesium bromide, isopropenylmagnesium bromide, 4-anisylmagnesium bromide, 1-methyl-1-propenylmagnesium bromide, 3-butenylmagnesium bromide, 1-propynylmagnesium bromide, 4-N,N-dimethylanilinemagnesium bromide, and 1-10 naphthylmagnesium bromide following the procedure outlined in example 211. This procedure is outlined in the following Scheme.



15

Table 13 (LCMS Data<sup>2</sup>: Molecular ion and retention time)

RMgX	X-Ph				
	4-bromo-Ph	4-chloro-Ph	4-fluoro-Ph	3-chloro-Ph	2-fluoro-Ph
Methyl magnesium bromide	Ex. 211 364.51 (M-H) 1.117 min	Ex. 223 318.61 (M-H) 1.15 min	Ex. 235 302.64 (M-H) 1.06 min		
Hexyl magnesium bromide		Ex. 224 458.78 (M-H) 1.87 min	Ex. 236 442.78 (M-H) 1.80 min	Ex. 249 458.75 (M-H) 1.87 min	Ex. 261 442.78 (M-H) 1.81 min
Pentyl magnesium bromide	Ex. 212 476.49 (M-H) 1.76 min		Ex. 237 414.82 (M-H) 1.70 min	Ex. 250 430.76 (M-H) 1.76 min	Ex. 262 414.74 (M-H) 1.70 min

Table 13 (cont'd)

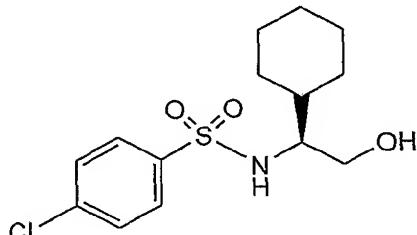
RMgX	X-Ph				
	4-bromo-Ph	4-chloro-Ph	4-fluoro-Ph	3-chloro-Ph	2-fluoro-Ph
Butyl magnesium bromide	Ex. 213 448.59 (M-H) 1.65 min	Ex. 225 402.72 (M-H) 1.63 min	Ex. 238 386.73 (M-H) 1.58 min	Ex. 251 402.68 (M-H) 1.65 min	
Isopropyl magnesium bromide			Ex. 239 358.70 (M-H) 1.47 min		
Isobutyl magnesium bromide	Ex. 214 448.58 (M-H) 1.65 min	Ex. 226 402.70 (M-H) 1.63 min	Ex. 240 386.73 (M-H) 1.58 min	Ex. 252 402.74 (M-H) 1.65 min	
Phenyl magnesium bromide	Ex. 215 488.51 (M-H) 1.50 min	Ex. 227 442.65 (M-H) 1.48 min		Ex. 253 442.64 (M-H) 1.50 min	Ex. 263 426.67 (M-H) 1.43 min
Allyl magnesium bromide	Ex. 216 416.53 (M-H) 1.43 min	Ex. 228 370.65 (M-H) 1.41 min	Ex. 241 354.69 (M-H) 1.34 min	Ex. 254 370.64 (M-H) 1.43 min	Ex. 264 354.67 (M-H) 1.35 min
Ethyl magnesium bromide	Ex. 217 392.55 (M-H) 1.37 min	Ex. 229 346.67 (M-H) 1.35 min	Ex. 242 330.67 (M-H) 1.28 min	Ex. 255 346.66 (M-H) 1.37 min	Ex. 265 330.74 (M-H) 1.28 min
4-fluoro phenyl magnesium bromide					Ex. 266 462.64 (M-H) 1.45 min
4-chloro phenyl magnesium bromide	Ex. 218 556.39 (M-H) 1.61 min			Ex. 256 511.96 (M-H) 1.66 min	Ex. 267 494.57 (M-H) 1.56 min
isopropenyl magnesium bromide	Ex. 219 416.51 (M-H) 1.50 min	Ex. 230 370.64 (M-H) 1.48 min	Ex. 243 354.69 (M-H) 1.43 min	Ex. 257 370.66 (M-H) 1.48 min	Ex. 268 354.68 (M-H) 1.43 min
4-anisyl magnesium bromide		Ex. 231 502.64 (M-H) 1.43 min	Ex. 244 486.67 (M-H) 1.38 min	Ex. 258 502.62 (M-H) 1.43 min	Ex. 269 486.71 (M-H) 1.37 min
1-methyl-1-propenyl magnesium bromide	Ex. 220 444.59 (M-H) 1.63 min	Ex. 232 398.69 (M-H) 1.61 min	Ex. 245 382.73 (M-H) 1.54 min	Ex. 259 398.65(M-H) 1.61 min	Ex. 270 382.50 (M-H) 1.56 min

Table 13 (cont'd)

RMgX	X-Ph				
	4-bromo-Ph	4-chloro-Ph	4-fluoro-Ph	3-chloro-Ph	2-fluoro-Ph
3-butenyl magnesium bromide	Ex. 221 444.60 (M-H) 1.54 min	Ex. 233 398.66 (M-H) 1.52 min	Ex. 246 382.71 (M-H) 1.46 min	Ex. 260 518.68 (M-H) 1.21 min	Ex. 271 382.70 (M-H) 1.46 min
4-N,N-dimethyl aniline magnesium bromide			Ex. 247 512.73 (M-H) 0.97 min		
1-naphthyl magnesium bromide	Ex. 222 558.46 (M-H) 1.65 min	Ex. 234 542.56 (M-H) 1.63 min	Ex. 248 526.69 (M-H) 1.58 min		

## Example 272

## 4-Chloro-N-[(1S)-1-cyclohexyl-2-hydroxyethyl]benzenesulfonamide



5

A. Preparation of ( $\alpha$ S)- $\alpha$ -[[[4-chlorophenyl)sulfonyl]amino]cyclohexaneacetic acid

- To a solution of S-cyclohexylglycine (1.00 g, 5.16 mmol) in H<sub>2</sub>O (10 mL) and 10 THF (11 mL) was added 4-chlorobenzenesulfonyl chloride (1.53 g, 7.23 mmol) followed by 2.5N NaOH (8.26 mL) at 25°C with stirring. After 24 hours, the reaction was quenched by addition of 6 N HCl until pH=2. The reaction mixture was then extracted with EtOAc (2x50 mL). The combined organic extracts were washed with saturated brine (2x50 mL), dried over MgSO<sub>4</sub>, and evaporated to afford a white solid. 15 This white solid was taken up in Et<sub>2</sub>O, filtered and evaporated to afford an amorphous white solid which after washing with hexane afforded 0.90 g (52%) of product, mp

120-128°C. Mass Spectrum (+ESI): 354 ([M+Na]<sup>+</sup>). Anal: Calc'd for C<sub>14</sub>H<sub>18</sub>ClNO<sub>4</sub>S: C, 50.68; H, 5.47; N, 4.22. Found: C, 50.59; H, 5.46; N, 4.19.

B. Preparation of 4-Chloro-N-[(1S)-1-cyclohexyl-2-hydroxyethyl]benzenesulfonamide

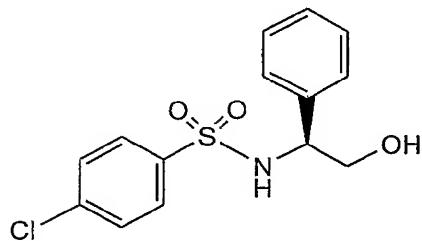
To a solution of LAH (1.0 M in THF, 1.5 mL, 1.5 mmol) was added dropwise at 0°C a solution of ( $\alpha$ S)- $\alpha$ -[[4-chlorophenyl)sulfonyl]amino]cyclohexaneacetic acid (0.50 g, 1.507 mmol) in THF (8.0 mL). After the addition was complete, the reaction mixture was allowed to warm to 25°C. After 24 hours, the reaction was quenched by sequential addition of H<sub>2</sub>O (60  $\mu$ L), 15% NaOH (60  $\mu$ L) and H<sub>2</sub>O (180  $\mu$ L). The precipitate was filtered and washed with THF. The combined THF solution was evaporated to a clear oil which afforded a white solid after washing with hexane. This white solid was purified by flash chromatography (eluant: 1-1 hexane/ethyl acetate), washed with hexane and pumped on to afford 0.179 g (37%) of the desired product as a white solid, mp 115-118°C.

Mass Spectrum (+APCI): 318 ([M+H]<sup>+</sup>). Anal: Calc'd for C<sub>14</sub>H<sub>20</sub>ClNO<sub>3</sub>S: C, 52.91; H, 6.34; N, 4.41. Found: C, 52.16; H, 6.25; N, 4.40.

Example 273

4-Chloro-N-[(1S)-2-hydroxy-1-phenylethyl]benzenesulfonamide

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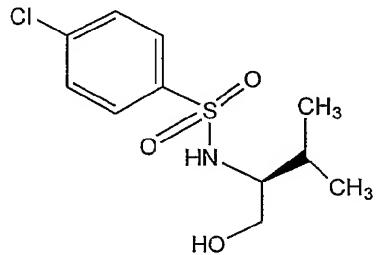
To a solution of S-2-phenyl-glycinol (0.50 g, 3.645 mmol) and Et<sub>3</sub>N (0.561 mL, 4.01 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (7.5 mL) was added dropwise at 0°C a solution of 4-chloro 25 benzenesulfonyl chloride (0.769 g, 3.645 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (7.5 mL). After the addition was complete, the reaction mixture was allowed to warm to 25°C. After 24 hours, the reaction was diluted with CH<sub>2</sub>Cl<sub>2</sub> (20 mL) and washed sequentially with saturated sodium bicarbonate (30 mL), 1N HCl (30 mL), H<sub>2</sub>O (30 mL) and saturated

brine (30 mL), dried over MgSO<sub>4</sub> and evaporated to a white solid which was washed with hexane twice. This white solid was purified by flash chromatography (eluant: 1-1 hexane/ethyl acetate), washed with hexane and pumped on to afford 0.347 g (29%) of the desired product as a white solid, mp 127-128°C. Mass Spectrum (+APCI): 329 ([(M+NH<sub>4</sub>)<sup>+</sup>]). Anal: Calc'd for C<sub>14</sub>H<sub>14</sub>ClNO<sub>3</sub>S: C, 53.93; H, 4.53; N, 4.49. Found: C, 53.96; H, 4.49; N, 4.39.

#### Example 274

##### 4-Chloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide

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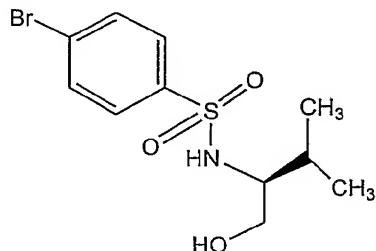


To a solution of S-valinol (0.52 g, 5.0 mmol), triethylamine (0.55 g, 5.5 mmol) and methylene chloride (10 mL) at 0°C, was added a solution of 4-15 chlorobenzenesulfonyl chloride (1.06 g, 5.0 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (5 mL). After 15 minutes the ice bath was removed and the reaction allowed to reach 25°C. After 16 hours, the reaction was quenched by pouring into saturated sodium bicarbonate solution (20 mL) and additional methylene chloride (15 mL). The organic phase was separated and washed sequentially with 1N HCl solution (20 mL), distilled water and 20 brine, dried over MgSO<sub>4</sub> and evaporated to give a colorless oil that crystallized upon standing, mp 83-85°C (1.30 g, 94%). MS (+ESI) 278.1 ([(M+H)<sup>+</sup>]); 257.2; 237.1. Anal. Calc'd for C<sub>11</sub>H<sub>16</sub>ClNO<sub>3</sub>S: C, 47.56; H, 5.81; N, 5.04. Found: C, 47.78; H, 5.81; N, 4.99.

25

## Example 275

4-Bromo-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide

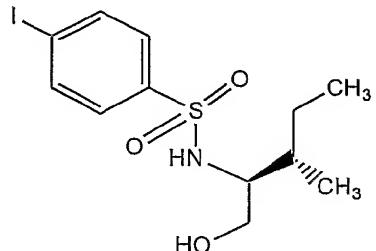


5

To a solution of S-valinol (0.52 g, 5.0 mmol), triethylamine (0.55 g, 5.5 mmol) and methylene chloride (10 mL) at 0°C, was added a solution of 4-bromobenzenesulfonyl chloride (1.28 g, 5.0 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (5 mL). After 15 minutes the ice bath was removed and the reaction allowed to reach 25°C. After 16 hours, the reaction was quenched by pouring into saturated sodium bicarbonate solution (20 mL) and additional methylene chloride (15 mL). The organic phase was separated and washed sequentially with 1N HCl solution (20 mL), distilled water and brine, dried over MgSO<sub>4</sub> and evaporated to give a colorless oil that crystallized upon standing under vacuum, mp 89-94°C (1.49 g, 93%). MS (+APCI) 324.03 ([M+H]<sup>+</sup>).  
Anal. Calc'd for C<sub>11</sub>H<sub>16</sub>BrNO<sub>3</sub>S: C, 41.00; H, 5.00; N, 4.35; Found: C, 41.09; H, 4.85; N, 4.28.

## Example 276

4-Iodo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide



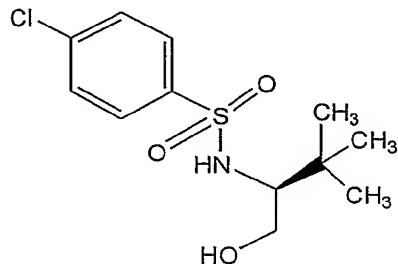
20

To a solution of S-isoleucinol (0.50 g, 4.26 mmol), triethylamine (0.47 g, 4.68 mmol) and methylene chloride (10 mL) at 0°C, was added a solution of 4-iodobenzenesulfonyl chloride (1.29 g, 4.26 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (5 mL). After 15 minutes

the ice bath was removed and the reaction allowed to reach 25°C. After 16 hours, the reaction was quenched by pouring into saturated sodium bicarbonate solution (22 mL) and additional methylene chloride (15 mL). The organic phase was separated and washed sequentially with 1N HCl solution (25 mL), distilled water and brine, dried over MgSO<sub>4</sub> and evaporated to give a crude solid that was recrystallized from ethyl acetate-hexane, mp 118-120°C (1.07 g, 66%). MS (+APCI) 383.96 ([M+H]<sup>+</sup>); 283.81; 191.95. Anal. Calc'd for C<sub>12</sub>H<sub>18</sub>INO<sub>3</sub>S: C, 37.61; H, 4.73; N, 3.65; Found: C, 37.55; H, 4.61; N, 3.61.

#### Example 277

10        4-Chloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide



To a solution of S-tert-leucinol (0.20 g, 1.70 mmol), triethylamine (0.19 g, 1.87 mmol) and methylene chloride (10 mL) at 0°C, was added a solution of 4-chloro 15 benzenesulfonyl chloride (0.36 g, 1.70 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (5 mL). After 15 minutes the ice bath was removed and the reaction allowed to reach 25°C. After 16 hours, the reaction was quenched by pouring into saturated sodium bicarbonate solution (20 mL) and additional methylene chloride (15 mL). The organic phase was separated and washed sequentially with 1N HCl solution (20 mL), distilled water and brine, dried over MgSO<sub>4</sub> and evaporated to give the desired product as a white solid, mp 128- 20 130°C (0.46 g, 94%). MS (+APCI) 292.06 ([M+H]<sup>+</sup>). Anal. Calc'd for C<sub>12</sub>H<sub>18</sub>ClNO<sub>3</sub>S: C, 49.39; H, 6.22; N, 4.80; Found: C, 49.40; H, 6.17; N, 4.79.

Table 14

Ex #	Compound
1	2-bromo-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
2	3-bromo-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
3	3-chloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
4	4-chloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]-1,2,3-benzoxadiazole-7-sulfonamide
5	2-chloro-4-fluoro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
6	5-chloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]-2-methoxybenzenesulfonamide
7	2-chloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]-6-methylbenzenesulfonamide
8	3,5-dichloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
9	2,4-difluoro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
10	4-fluoro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
11	2-fluoro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
12	N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]naphthalene-1-sulfonamide
13	N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]naphthalene-2-sulfonamide
14	3-amino-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
15	N-[(1S)-1-benzyl-2-hydroxyethyl]-4-bromobenzenesulfonamide
16	4-bromo-N-[(1S)-1-cyclohexyl-2-hydroxyethyl]benzenesulfonamide
17	4-bromo-N-[(1R)-2-hydroxy-1-(4-hydroxyphenyl)ethyl]benzenesulfonamide
18	4-bromo-N-[(1S)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide
19	4-bromo-N-[(1S)-2-hydroxy-1-(1H-indol-2-ylmethyl)ethyl]benzenesulfonamide
20	4-bromo-2,5-difluoro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
21	2,5-dibromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
22	3,4-dibromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
23	2,3-dichloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
24	3,4-dichloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
25	2,4,5-trichloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
26	4-bromo-2,5-difluoro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide
27	3,4-dichloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide
28	2,4,6-trichloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
29	3,4-dibromo-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide
30	3,4-dichloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide
31	2,4,5-trichloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide
32	2,4,6-trichloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide
33	4-bromo-N-[(1R,2R)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
34	4-bromo-N-[(1S)-1-(hydroxymethyl)-1,2-dimethylpropyl]benzenesulfonamide
35	4-bromo-N-[1-(hydroxymethyl)-2-phenylpropyl]benzenesulfonamide
36	4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
37	4-chloro-N-[(1S)-1-(hydroxymethyl)-1,2-dimethylpropyl]benzenesulfonamide
38	4-chloro-N-[1-(hydroxymethyl)-2-phenylpropyl]benzenesulfonamide
39	4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
40	N-allyl-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
41	N-[(1,1'-biphenyl)-4-ylmethyl)-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
42	tert-butyl 2-{{(4-chlorophenyl)sulfonyl}[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]amino}ethylcarbamate
43	4-chloro-N-(4-chlorobenzyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
44	4-chloro-N-(cyclobutylmethyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
45	4-chloro-N-(3,4-dimethoxybenzyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
46	4-chloro-N-(2-furylmethyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
47	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-N-[2-(methylthio)ethyl]benzenesulfonamide
48	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-N-(3-phenylprop-2-ynyl)benzenesulfonamide
49	4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl)propyl]benzenesulfonamide
50	4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-methyloctyl]benzenesulfonamide
51	4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-phenylpropyl]benzenesulfonamide
52	4-chloro-N-[(1S)-2-ethyl-1-(hydroxymethyl)butyl]benzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
53	4-chloro-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)-4-methylpentyl]benzenesulfonamide
54	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylpentyl]benzenesulfonamide
55	4-chloro-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)pentyl]benzenesulfonamide
56	4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-4-methyl-2-propylpentyl]benzenesulfonamide
57	4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl)pentyl]benzenesulfonamide
58	4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-propyloctyl]benzenesulfonamide
59	4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-phenylpentyl]benzenesulfonamide
60	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylheptyl]benzenesulfonamide
61	4-chloro-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)heptyl]benzenesulfonamide
62	4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-pentylOctyl]benzenesulfonamide
63	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-phenylpropyl]benzenesulfonamide
64	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-4-methyl-2-phenylpentyl]benzenesulfonamide
65	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-phenyloctyl]benzenesulfonamide
66	4-chloro-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)butyl]benzenesulfonamide
67	4-chloro-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)-4-methylpentyl]benzenesulfonamide
68	4-chloro-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)octyl]benzenesulfonamide
69	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2,3-dimethylbutyl]benzenesulfonamide
70	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-isopropylOctyl]benzenesulfonamide
71	4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl)propyl]benzenesulfonamide
72	4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-methyloctyl]benzenesulfonamide
73	4-bromo-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)-4-methylpentyl]benzenesulfonamide
74	4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl)butyl]benzenesulfonamide
75	4-bromo-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)octyl]benzenesulfonamide
76	4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylpentyl]benzenesulfonamide
77	4-bromo-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)pentyl]benzenesulfonamide
78	4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-4-methyl-2-propylpentyl]benzenesulfonamide
79	4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-propylOctyl]benzenesulfonamide
80	4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylheptyl]benzenesulfonamide
81	4-bromo-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)heptyl]benzenesulfonamide
82	4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-phenylpropyl]benzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
83	4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-phenylbutyl]benzenesulfonamide
84	4-bromo-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)propyl]benzenesulfonamide
85	4-bromo-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)butyl]benzenesulfonamide
86	4-bromo-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)-4-methylpentyl]benzenesulfonamide
87	4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-isopropyl-4-methylpentyl]benzenesulfonamide
88	4-chloro-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)octyl]benzenesulfonamide
89	4-chloro-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)octyl]benzenesulfonamide
90	4-chloro-N-methyl-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
91	4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-benzenesulfonamide
92	4-chloro-N-[(1S)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide
93	4-chloro-N-[(1R,2S)-2-hydroxy-1-methyl-2-phenylethyl]benzenesulfonamide
94	4-bromo-N-[1-(hydroxymethyl)cyclopentyl]benzenesulfonamide
95	4-chloro-N-[(1S)-2-cyclohexyl-1-(hydroxymethyl)ethyl]benzenesulfonamide
96	N-{(1S)-1-[4-(benzyloxy)benzyl]-2-hydroxyethyl}-4-chlorobenzenesulfonamide
97	4-chloro-N-[(1R)-1-(hydroxymethyl)-1-methylpropyl]benzenesulfonamide
98	4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-benzenesulfonamide
99	4-bromo-N-[1-(hydroxymethyl)pentyl]benzenesulfonamide
100	4-bromo-N-[(1R,2S)-2-hydroxy-1-methyl-2-phenylethyl]benzenesulfonamide
101	4-bromo-N-[(1S)-2-hydroxy-1-phenylethyl]benzenesulfonamide
102	4-bromo-N-[(1R)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide
103	4-chloro-N-[1-(hydroxymethyl)cyclopentyl]benzenesulfonamide
104	4-bromo-N-[1-(hydroxymethyl)butyl]benzenesulfonamide
105	3-chloro-N-[1-(hydroxymethyl)butyl]benzenesulfonamide
106	3-chloro-N-[(1S)-2-cyclohexyl-1-(hydroxymethyl)ethyl]benzenesulfonamide
107	3-chloro-N-[(1R)-1-(hydroxymethyl)-3-(methylthio)propyl]benzenesulfonamide
108	3-chloro-N-[(1S)-1-(hydroxymethyl)propyl]benzenesulfonamide
109	2-fluoro-N-[(1S)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide
110	2-fluoro-N-[1-(hydroxymethyl)pentyl]benzenesulfonamide
111	2-fluoro-N-[(1R,2S)-2-hydroxy-1-methyl-2-phenylethyl]benzenesulfonamide
112	2-fluoro-N-[(1S)-2-hydroxy-1-phenylethyl]benzenesulfonamide
113	2-fluoro-N-[(1R)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide
114	2-fluoro-N-[1-(hydroxymethyl)cyclopentyl]benzenesulfonamide
115	N-[(1S)-2-cyclohexyl-1-(hydroxymethyl)ethyl]-2-fluorobenzenesulfonamide
116	2-fluoro-N-{(1S,2S)-2-hydroxy-1-(hydroxymethyl)-2-[4-(methylthio)phenyl]ethyl}benzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
117	2-fluoro-N-[(1S)-1-(hydroxy1-methylethyl)benzenesulfonamide
118	N-[(1S)-1-benzyl-2-hydroxyethyl]-2-fluorobenzenesulfonamide
119	2-fluoro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide
120	4-bromo-N-[1-(hydroxymethyl)cyclohexyl]benzenesulfonamide
121	4-bromo-N-[2-(hydroxymethyl)bicyclo[2.2.1.]hept-2-yl]benzenesulfonamide
122	4-bromo-N-[1-(hydroxymethyl)-2,3-dihydro-1H-inden-1-yl]benzenesulfonamide
123	4-chloro-N-[1-(hydroxymethyl)cyclohexyl]benzenesulfonamide
124	4-chloro-N-[1-(hydroxymethyl)-2,3-dihydro-1H-inden-1-yl]benzenesulfonamide
125	4-chloro-N-(1-cyclobutyl-2-hydroxy-1-phenylethyl)benzenesulfonamide
126	4-fluoro-N-[(1S,2S)-1-(1-hydroxyethyl)-2-methylbutyl]benzenesulfonamide
127	N-{(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl}-4-fluoro benzenesulfonamide
128	4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]octyl]benzenesulfonamide
129	4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl]benzenesulfonamide
130	4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl]benzenesulfonamide
131	4-fluoro-N-[(1S,2S)-1-[hydroxy(2-methylphenyl)methyl]-2-methylbutyl] benzenesulfonamide
132	4-fluoro-N-[(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl] benzenesulfonamide
133	4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-butenyl] benzenesulfonamide
134	4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl] benzenesulfonamide
135	4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl]benzenesulfonamide
136	N-{(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}-4- fluorobenzenesulfonamide
137	4-fluoro-N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]-3-pentenyl] benzenesulfonamide
138	4-fluoro-N-[(1S)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]-3-butenyl] benzenesulfonamide
139	4-fluoro-N-[(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl] benzenesulfonamide
140	N-{(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}-4- fluorobenzenesulfonamide
141	4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl] benzenesulfonamide
142	4-fluoro-N-[(1S,2S)-1-{hydroxy[4-(methylsulfanyl)phenyl]methyl}-2- methylbutyl]benzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
143	N-{(1S,2S)-1-[[4-(dimethylamino)phenyl](hydroxy)methyl]-2-methylbutyl}-4-fluorobenzenesulfonamide
144	4-fluoro-N-{(1S,2S)-1-[hydroxy(1-naphthyl)methyl]-2-methylbutyl}benzenesulfonamide
145	4-bromo-N-[(1S,2S)-1-(1-hydroxyethyl)-2-methylbutyl]benzenesulfonamide
146	4-bromo-N-{(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide
147	4-bromo-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl}benzenesulfonamide
148	4-bromo-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide
149	4-bromo-N-{(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide
150	4-bromo-N-{(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide
151	4-bromo-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-butenyl}benzenesulfonamide
152	4-bromo-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}benzenesulfonamide
153	4-bromo-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide
154	4-bromo-N-{(1S,2S)-1-[(4-fluorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide
155	4-bromo-N-{(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide
156	4-bromo-N-{(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]-3-pentenyl}benzenesulfonamide
157	4-bromo-N-{(1S)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]-3-but enyl}benzenesulfonamide
158	4-bromo-N-{(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl}benzenesulfonamide
159	4-bromo-N-{(1S,3E)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]-3-pentenyl}benzenesulfonamide
160	4-bromo-N-{(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide
161	4-bromo-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide
162	4-bromo-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-pentynyl}benzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
163	4-bromo-N-((1S,2S)-1-{hydroxy[4-(methylsulfanyl)phenyl]methyl}-2-methylbutyl)benzenesulfonamide
164	4-bromo-N-((1S,2S)-1-[[4-(dimethylamino)phenyl](hydroxy)methyl]-2-methylbutyl)benzenesulfonamide
165A	4-chloro-N-[(1S,2S)-1-formyl-2-methylbutyl]benzenesulfonamide
165	4-chloro-N-[(1S,2S)-1-(1-hydroxyethyl)-2-methylbutyl]benzenesulfonamide
166	4-chloro-N-((1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl)benzenesulfonamide
167	4-chloro-N-((1S)-2-hydroxy-1-[(1S)-1-methylpropyl]octyl) benzenesulfonamide
168	4-chloro-N-((1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl) benzenesulfonamide
169	4-chloro-N-((1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl) benzenesulfonamide
170	4-chloro-N-((1S)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]butyl) benzenesulfonamide
171	4-chloro-N-((1S,2S)-1-[hydroxy(2-methylphenyl)methyl]-2-methylbutyl) benzenesulfonamide
172	4-chloro-N-((1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl) benzenesulfonamide
173	4-chloro-N-((1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]pentyl) benzenesulfonamide
174	4-chloro-N-((1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-butenyl) benzenesulfonamide
175	4-chloro-N-((1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl) benzenesulfonamide
176	4-chloro-N-((1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl) benzenesulfonamide
177	4-chloro-N-((1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl)benzenesulfonamide
178	4-chloro-N-((1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl)benzenesulfonamide
179	4-chloro-N-((1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl)benzenesulfonamide
180	4-chloro-N-((1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl) benzenesulfonamide
181	4-chloro-N-((1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-pentynyl) benzenesulfonamide
182	4-chloro-N-((1S,2S)-1-{hydroxy[4-(methylsulfanyl)phenyl]methyl}-2-methylbutyl)benzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
183	4-chloro-N-[(1S,2S)-1-[[4-(dimethylamino)phenyl](hydroxy)methyl]-2-methylbutyl]benzenesulfonamide
184	4-chloro-N-[(1S,2S)-1-[hydroxy(1-naphthyl)methyl]-2-methylbutyl]benzenesulfonamide
185	3-chloro-N-[(1S,2S)-1-(1-hydroxyethyl)-2-methylbutyl]benzenesulfonamide
186	3-chloro-N-[(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl]benzenesulfonamide
187	3-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]octyl]benzenesulfonamide
188	3-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl]benzenesulfonamide
189	3-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl]benzenesulfonamide
190	3-chloro-N-[(1S)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]butyl]benzenesulfonamide
191	3-chloro-N-[(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl]benzenesulfonamide
192	3-chloro-N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]pentyl]benzenesulfonamide
193	3-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-butenyl]benzenesulfonamide
194	3-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl]benzenesulfonamide
195	3-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl]benzenesulfonamide
196	3-chloro-N-[(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl]benzenesulfonamide
197	3-chloro-N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]-3-pentenyl]benzenesulfonamide
198	3-chloro-N-[(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl]benzenesulfonamide
199	3-chloro-N-[(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl]benzenesulfonamide
200	3-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl]benzenesulfonamide
201	3-chloro-N-[(1S,2S)-1-{hydroxy[4-(methylsulfanyl)phenyl]methyl}-2-methylbutyl]benzenesulfonamide
202	N-[(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl]-2-fluoro benzenesulfonamide
203	2-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]octyl]benzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
204	2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl} benzenesulfonamide
205	2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl} benzenesulfonamide
206	2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-but enyl} benzenesulfonamide
207	2-fluoro-N-{(1S,2S)-1-[(4-fluorophenyl)(hydroxy)methyl]-2-methylbutyl} benzenesulfonamide
208	N-{(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}-2-fluoro benzenesulfonamide
209	2-fluoro-N-{(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl} benzenesulfonamide
210	N-{(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}-2-fluorobenzenesulfonamide
211	4-bromo-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-methylbutyl] benzenesulfonamide
212	4-bromo-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl} benzenesulfonamide
213	4-bromo-N-{(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl} benzenesulfonamide
214	4-bromo-N-{(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl] pentyl} benzenesulfonamide
215	4-bromo-N-{(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl} benzenesulfonamide
216	N-{(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}-4-bromo benzenesulfonamide
217	4-bromo-N-{(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl} benzenesulfonamide
218	N-{(1S,2S)-1-[bis(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}-4-bromobenzenesulfonamide
219	4-bromo-N-{(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-but enyl} benzenesulfonamide
220	4-bromo-N-{(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl} benzenesulfonamide
221	4-bromo-N-{(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl} benzenesulfonamide
222	4-bromo-N-((1S,2S)-1-{hydroxy[di(1-naphthyl)]methyl}-2-methylbutyl) benzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
223	4-chloro-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-methylbutyl]benzenesulfonamide
224	4-chloro-N-{(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide
225	N-{(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}-4-chlorobenzenesulfonamide
226	4-chloro-N-{(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide
227	4-chloro-N-[(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl]benzenesulfonamide
228	N-[(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl]-4-chlorobenzenesulfonamide
229	4-chloro-N-[(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl]benzenesulfonamide
230	4-chloro-N-[(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-butenyl]benzenesulfonamide
231	4-chloro-N-((1S,2S)-1-{hydroxy[bis(4-methoxyphenyl)]methyl}-2-methylbutyl)benzenesulfonamide
232	4-chloro-N-[(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl]benzenesulfonamide
233	N-[(1S)-2-(3-butenyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl]-4-chlorobenzenesulfonamide
234	4-chloro-N-((1S,2S)-1-{hydroxy[di(1-naphthyl)]methyl}-2-methylbutyl)benzenesulfonamide
235	4-fluoro-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-methylbutyl]benzenesulfonamide
236	4-fluoro-N-[(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl]benzenesulfonamide
237	4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl]benzenesulfonamide
238	N-[(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl]-4-fluorobenzenesulfonamide
239	4-fluoro-N-[(1S)-2-hydroxy-2-isopropyl-3-methyl-1-[(1S)-1-methylpropyl]butyl]benzenesulfonamide
240	4-fluoro-N-[(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl]benzenesulfonamide
241	N-[(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl]-4-fluorobenzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
242	N-{(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}-4-fluorobenzenesulfonamide
243	4-fluoro-N-[(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-butenyl]benzenesulfonamide
244	4-fluoro-N-[(1S,2S)-1-{hydroxy[bis(4-methoxyphenyl)]methyl}-2-methylbutyl]benzenesulfonamide
245	4-fluoro-N-[(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl]benzenesulfonamide
246	N-[(1S)-2-(3-butenyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl]-4-fluorobenzenesulfonamide
247	N-[(1S,2S)-1-[bis[4-(dimethylamino)phenyl](hydroxy)methyl]-2-methylbutyl]-4-fluorobenzenesulfonamide
248	4-fluoro-N-[(1S,2S)-1-{hydroxy[di(1-naphthyl)]methyl}-2-methylbutyl]benzenesulfonamide
249	3-chloro-N-[(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl]benzenesulfonamide
250	3-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl]benzenesulfonamide
251	N-[(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl]-3-chlorobenzenesulfonamide
252	3-chloro-N-[(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl]benzenesulfonamide
253	3-chloro-N-[(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl]benzenesulfonamide
254	N-[(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl]-3-chlorobenzenesulfonamide
255	3-chloro-N-[(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl]benzenesulfonamide
256	N-[(1S,2S)-1-[bis(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl]-3-chlorobenzenesulfonamide
257	3-chloro-N-[(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-butenyl]benzenesulfonamide
258	3-chloro-N-[(1S,2S)-1-{hydroxy[bis(4-methoxyphenyl)]methyl}-2-methylbutyl]benzenesulfonamide
259	3-chloro-N-[(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl]benzenesulfonamide
260	N-[(1S)-2-(3-butenyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl]-3-chlorobenzenesulfonamide

Table 14 (cont'd)

Ex #	Compound
261	2-fluoro-N-[(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl]benzenesulfonamide
262	2-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl]benzenesulfonamide
263	2-fluoro-N-[(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl]benzenesulfonamide
264	N-[(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl]-2-fluoro benzenesulfonamide
265	N-[(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl]-2-fluoro benzenesulfonamide
266	N-[(1S,2S)-1-[bis(4-fluorophenyl)(hydroxy)methyl]-2-methylbutyl]-2-fluoro benzenesulfonamide
267	N-[(1S,2S)-1-[bis(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl]-2-fluoro benzenesulfonamide
268	2-fluoro-N-[(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-but enyl]benzenesulfonamide
269	2-fluoro-N-[(1S,2S)-1-{hydroxy[bis(4-methoxyphenyl)]methyl}-2-methylbutyl]benzenesulfonamide
270	2-fluoro-N-[(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl]benzenesulfonamide
271	N-[(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl]-2-fluorobenzenesulfonamide
272	4-chloro-N-[(1S)-1-cyclohexyl-2-hydroxyethyl]benzenesulfonamide
273	4-chloro-N-[(1S)-2-hydroxy-1-phenylethyl]benzenesulfonamide
274	4-chloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide
275	4-bromo-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide
276	4-iodo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide
277	4-chloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide

## Example 278 - Repressor Release Assay (RRA)

5       The beta amyloid inhibitory activity of the compounds of the present invention was determined using the Repressor Release Assay (RRA). See, Table 17. A compound was considered active in RRA if it leads to at least a 1.5 fold increase in luciferase activity at 10 µg/mL and was non-toxic.

## A.     Cell Culture

10       CHO-K1 cells were cultured in whole DMEM media (DMEM - High Glucose with 10% fetal bovine serum, 1% Non-essential Amino Acids, and 1%

Penicillin-Streptomycin) at 37°C with 5% CO<sub>2</sub>. Two million cells were plated into 10-cm dishes 24 hrs prior to transfection.

Transient transfections were completed as recommended by Gibco BRL using their Lipofectamine Plus system. First, 6 µg of pRSVO-luc and 6 µg of APP-lacI construct DNA were added to 460 µL Opti-Mem transfection media and incubated with 30 µL Plus reagent for 15 minutes. Then, a lipid mixture of 40 µL Lipofectamine reagent and 460 µL Opti-Mem transfection media was incubated with the DNA-Plus reagent mixture for 15 minutes. During the DNA-lipid incubation, the CHO-K1 cells were washed once and covered in 5.0 mL DMEM media without Penicillin-Streptomycin. The DNA-lipid preparation was then layered onto these cells and incubated at 37°C overnight.

One and one half million transfected cells per well (100 µL total volume) were plated into sterile, opaque Packard 96-well Culture-Plates in clear DMEM whole media (DMEM - without phenol red) and incubated at 37°C with 5% CO<sub>2</sub> for 3-5 hours.

B. Compound Dilution

Compounds were diluted using two different protocols; one protocol was used for compounds supplied neat (weighed powder in vial) and the other protocol was used for compounds supplied in solution (20 mM in DMSO in 96-well plates). For both protocols, 25 mM Hepes and 25 mM Hepes/1% DMSO were prepared fresh to be used as diluent. The Hepes/DMSO was used as the diluent control on all experimental plates.

The following table depicts the steps for compound dilution (please note that the last step was the addition of compound to cells/media in tissue culture plate).

Table 15

	Concentration	Dilution
Stock Solution	10 mg/mL	x mg compound (vial) diluted with 100% DMSO
Dilution 1	1 mg/mL	20 µL stock solution 180 µL 25mM Hepes
Dilution 2	200 µg/mL	60 µL Dilution 1 240 µL 25 mM Hepes
Dilution 3 (in Cell Plate)	20 µg/mL	11.3 µL Dilution 2 (in 100 µL cells/well)

Because some compounds were present in 96-well format at 20 mM, the following represents the protocol for their dilution (note that an average molecular weight of these compounds was used to calculate these dilutions and as above, the last step was the addition of compound to cells/media in tissue culture plate).

Table 16

	Concentration	Dilution
Stock Solution (original conc.)	-	20 mM Solution
Dilution 1	~200 µg/mL	6 µL stock solution 194 µL 25 mM Hepes
Dilution 2 (in Cell Plate)	~20 µg/mL	11.3µL Dilution 2 (in 100 µL cells/well)

Once the compounds were diluted, they were applied in duplicate on cells in tissue culture plates (prepared above). Cells were incubated with compound at 37°C with 5% CO<sub>2</sub> for an additional 36-48 hours.

### C. Assay Measurement

Luciferase assays (LucLite reagent, Packard) were performed and were read on a Packard TopCount instrument. Media was removed from each 96-well plate and replaced with 100 µL PBS per well (with Mg<sup>2+</sup> and Ca<sup>2+</sup>). An equal volume (100 µL) of the LucLite lysis/substrate buffer was added to each well and the plates were sealed and mixed in the dark on a rotary shaker for 15-30 minutes at room temperature. Luciferase readings were then taken on the TopCount instrument.

Measurements were expressed as relative light units (RLU) and are calculated and analyzed in MS Excel as follows:

D. Analysis of data

“Fold Increase” refers to the amount of luciferase activity (measured in relative light units) over diluent control. “SEM” refers to the standard error of the mean for fold increase. “Activity”: A compound is considered active if it results in at least a 1.5 fold increase in luciferase activity at 10 µg/µL. 1= non-toxic, 0=toxic in Table 17. “Toxicity” is determined by loss of signal ( $\leq 0.75$  fold increase).

E. Standard beta amyloid inhibitor

The reference gamma secretase inhibitor DAPT (LY374973, AN37124: Dovey, H.F. et al, J. Neurochem. 76: 173-181 (2001)) was prepared as outlined in WO 98/22494 and tested in RRA and exhibited a 6.0-28.1 fold increase in luciferase activity at 20 µg/mL.

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Table 17 – Repressor Release Assay

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
91	10	2.38	92.18	1
	3	1.71	66.26	1
	20	5	116.7	1
	20	3.1	81	1
	20	4.4	154.8	1
	20	3.8	105	1
	20	2	46.8	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
98	10	2.58	100	1
	10	2.91	112.76	1
	10	3.09	100	1
	10	3.26	100	1
	10	2.56	100	1
	10	2.7	100	1
	10	2.62	100	1
	10	2.5	100	1
	10	2.17	100	1
	10	2.92	100	1
	10	2.11	100	1
	10	2.36	100	1
	10	2.06	100	1
	10	2.25	100	1
	10	2.75	100	1
	10	2.52	100	1
	10	5.5	100	1
	10	3.2	100	1
	10	4.3	100	1
	10	3.5	100	1
	10	3.8	100	1
	20	3.7	100	1
	10	3.3	100	1
	10	2.69	100	1
	20	5.6	100	1
	20	5.5	100	1
	20	5.8	100	1
	20	4.4	100	1
	20	3.2	100	1
	20	2.7	100	1
	20	3.3	100	1
	20	3.3	100	1
	20	3.6	100	1
	20	4.4	100	1
	20	3.9	100	1
	20	3.7	100	1
	20	4.2	100	1
	20	7	100	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
Ex 98 (cont.)	20	19.5	100	1
	20	4.2	100	1
	20	5.5	100	1
	20	4	100	1
	20	3.2	100	1
	20	4.4	100	1
	20	3.5	100	1
	20	4.5	100	1
	20	5.7	100	1
	20	5.4	100	1
	20	3.4	100	1
	20	2.9	100	1
	20	3.3	100	1
	20	3.3	100	1
	20	3.2	100	1
	20	3.5	100	1
	20	4.3	100	1
	20	4.3	100	1
	20	6.8	158.9	1
	20	3.9	100	1
	20	4.2	100	1
	20	2.7	100	1
	10	2.53	100	1
	20	3	76.7	1
	10	2.9	100	1
	10	2.78	100	1
	10	2.47	95.68	1
	3	1.79	69.39	1
274	20	2.1	44.8	1
	20	2.4	43.2	1
272	20	2.3	81.3	1
275	20	2	41.9	1
	20	1.8	32.5	1
90	20	1.6	54.4	1
276	20	2	46.3	1
	20	2.1	73.4	1
277	20	1.5	53.4	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
1	20	1.6	27.2	1
2	20	2.8	48.1	1
3	20	3.6	62.9	1
4	20	1.5	26.5	1
5	20	2.5	43.2	1
6	20	1.7	30.2	1
7	20	1.6	27.1	1
8	20	2	35.3	1
9	10	2.2	63.5	1
	20	1.8	30.5	1
10	20	2.4	62.5	1
	20	3.6	63.2	1
10	20	3.3	113.6	1
11	20	2.3	63.2	1
12	20	2.9	54	1
13	20	1.8	33.5	1
15	20	1.5	26.5	1
16	20	2.7	68.5	1
17	20	2.2	56.4	1
18	20	1.9	48.6	1
	20	1.7	41.8	1
19	20	1.6	40.5	1
273	20	1.5	38.7	1
14	20	1.9	67	1
20	20	3.3	78.2	1
21	20	1.6	37.2	1
22	20	1.7	39.5	1
23	10	3.6	116.23	1
	20	8.3	197.5	1
	3	1.67	54.13	1
24	20	1.6	38.6	1
25	20	1.8	44.1	1
26	20	2.4	58	1
27	20	2.2	53.6	1
28	20	1.5	34.8	1
29	20	2.1	49.5	1
30	20	2.1	50.5	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
31	20	2.8	66.7	1
32	20	2.2	51.6	1
33	20	3.9	112	1
34	20	4.2	122.5	1
35	20	2.4	68.1	1
36	10	3.33	107.5	1
	20	6.4	186.2	1
	20	4.5	107	1
	1	1.6	51.68	1
	3	2.05	66.34	1
37	20	4.7	136.5	1
38	20	3.3	94.8	1
39	10	2.47	79.99	1
	20	5.5	158.9	1
	3	1.56	50.53	1
92	20	1.7	43.2	1
99	20	1.7	42.9	1
93	20	1.5	39.2	1
100	20	1.6	41	1
101	20	1.6	42	1
102	20	1.5	39.6	1
94	20	2.5	69.2	1
	20	1.7	38	1
104	20	1.5	31.2	1
103	20	2.6	70.8	1
	20	1.5	34.9	1
95	20	1.6	36.3	1
96	20	1.5	44.7	1
106	20	1.6	32.8	1
107	1	2.35	91.1	1
105	10	1.54	47.3	1
108	3	1.66	59.78	1
112	20	1.8	50.3	1
113	20	1.6	43.9	1
109	20	1.9	52.6	1
110	20	1.7	46.5	1
111	20	1.7	47.8	1
116	20	1.6	44.8	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
114	20	1.5	30.9	1
117	20	1.5	31	1
115	20	1.8	37.3	1
118	20	1.6	33.6	1
119	20	1.5	46.5	1
227	10	1.65	75.91	1
165	10	2.05	70.81	1
	10	1.6	63.92	1
97	20	1.5	47.3	1
126	10	1.52	59.52	1
	3	1.54	56.2	1
127	10	2.97	116.04	1
128	10	10.76	420.7	1
	10	2.13	77.43	1
129	10	7.12	278.35	1
	10	1.62	59.13	1
130	10	2.4	93.87	1
131	10	1.65	64.57	1
132	10	1.54	60.21	1
133	10	1.79	79.67	1
134	10	3	133.7	1
	10	2.6	47	1
	3	1.5	27.5	1
135	10	1.91	84.91	1
	10	2	37	1
136	10	3.04	135.09	1
137	10	1.61	71.59	1
138	10	1.57	69.78	1
139	10	2.12	94.48	1
140	10	1.52	67.81	1
141	10	1.79	76.02	1
142	10	2.71	114.62	1
143	10	5.72	242.28	1
144	10	1.69	71.37	1
145	10	3.9	152.49	1
	10	2.57	102.15	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
146	10	4.26	166.6	1
	3	1.53	60.66	1
	10	2.33	92.64	1
147	10	1.94	75.86	1
148	10	1.88	73.4	1
149	10	4.29	167.71	1
	10	2.02	80.24	1
150	10	3.39	132.65	1
	10	1.59	63.18	1
151	10	2.9	129.13	1
152	10	6.64	295.59	1
	10	3.7	67.7	1
	3	1.6	29.7	1
153	10	4.77	212.3	1
	3	2	36.2	1
	10	2.9	53.4	1
154	10	1.68	74.73	1
155	10	4.37	194.25	1
156	10	2.01	89.37	1
	10	1.64	106.77	1
	3	1.52	98.84	1
157	10	1.96	87.36	1
158	10	2.28	101.49	1
159	10	2.11	94.03	1
160	10	1.66	73.83	1
161	10	1.69	71.57	1
162	10	1.63	68.85	1
163	10	1.64	69.41	1
164	10	3.53	149.31	1
166	10	5.49	189.28	1
	10	2.05	82.01	1
167	10	9.66	332.83	1
168	10	8.32	286.71	1
	10	2.2	87.86	1
169	10	2.85	98.28	1
	10	2.01	80.19	1
170	10	1.92	66.13	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
171	10	1.54	53.17	1
172	10	2.51	86.45	1
	10	1.59	63.78	1
173	10	2.56	88.08	1
174	10	2.1	102.08	1
175	10	4.24	205.87	1
	10	2.01	124.61	1
176	10	2.63	127.84	1
	10	1.87	116.42	1
177	10	1.95	94.93	1
178	10	1.68	81.88	1
179	10	1.63	79.4	1
180	10	1.69	80.17	1
181	10	1.76	83.43	1
182	10	2.58	122.24	1
183	10	4.49	212.53	1
184	10	1.7	80.39	1
185	10	1.51	51.91	1
186	10	3.86	133.06	1
187	10	9.02	310.99	1
188	10	3.54	122.17	1
189	10	1.51	52.11	1
190	10	1.76	60.57	1
191	10	2.42	83.48	1
192	10	2.21	76.01	1
193	10	1.78	86.66	1
194	10	3.42	166.42	1
	10	1.97	122.18	1
195	10	2.16	104.89	1
196	10	1.78	86.69	1
197	10	1.54	74.67	1
198	10	1.54	74.68	1
199	10	1.61	78.5	1
200	10	1.85	87.52	1
201	10	2.45	116.18	1
202	10	1.62	55.79	1
203	10	3.47	119.61	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
204	10	3.73	128.72	1
205	10	1.72	59.11	1
206	10	1.9	92.42	1
207	10	1.81	87.79	1
208	10	2.01	97.83	1
209	10	1.81	88.04	1
210	10	1.68	81.7	1
211	10	2.09	71.66	1
212	10	4.85	166.42	1
	10	2.4	70.1	1
213	10	3.03	103.82	1
	10	1.6	46.4	1
214	10	4.93	169.16	1
	10	1.8	53.2	1
215	10	1.65	75.81	1
216	10	1.58	72.76	1
217	10	1.68	77.38	1
218	10	1.55	71.25	1
219	10	1.8	82.73	1
	20	2.8	75.9	1
220	10	3.29	151.23	1
221	10	5.73	263.29	1
222	10	1.59	54.46	1
223	10	2.33	79.87	1
224	10	2.22	76.16	1
225	10	6.82	234.08	1
226	10	4.6	157.69	1
228	10	1.56	71.57	1
229	10	1.52	69.7	1
230	10	1.75	80.53	1
	20	1.9	51	1
231	10	2.49	114.39	1
232	10	1.94	89.04	1
	20	4.2	115	1
233	10	6.67	306.66	1
234	10	2.9	99.47	1
	10	1.6	49.5	1
235	10	1.88	64.32	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
236	10	6.55	224.57	1
	10	3.2	101.3	1
237	10	6.05	207.45	1
	10	3.8	119.8	1
238	10	4.5	154.18	1
239	10	1.54	52.99	1
240	10	3.82	131.15	1
241	10	1.58	72.82	1
242	10	1.6	73.53	1
243	10	1.7	78.07	1
244	10	1.51	69.29	1
245	10	2.05	94.29	1
	20	3.5	95.1	1
246	10	2.42	111.39	1
	20	1.9	50.9	1
247	10	1.54	57.33	1
248	10	3.53	121.19	1
	10	1.5	46.6	1
249	10	1.9	58.4	1
250	10	2.4	72.2	1
251	10	3.4	103.5	1
252	10	1.8	53.8	1
253	10	1.61	59.95	1
254	10	1.93	71.92	1
255	10	2.03	75.56	1
256	10	1.5	55.91	1
257	10	2.54	94.5	1
	20	2.5	68.8	1
258	10	1.72	63.9	1
259	10	2.19	81.37	1
	1	1.7	31.1	1
	0.3	1.7	31.1	1
	3	1.7	31.5	1
	10	1.6	49.1	1
	20	4.4	119.7	1
	10	1.7	31.6	1
260	10	6.23	231.76	1
	3	1.5	26.7	1

Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
261	10	3.5	104.4	1
262	10	2.2	63.8	1
263	10	1.57	58.4	1
264	10	2	74.18	1
265	10	1.78	66.02	1
266	10	1.57	58.25	1
267	10	1.59	58.97	1
268	10	1.75	65.06	1
269	10	1.58	58.74	1
270	10	1.86	69.21	1
271	10	1.82	67.61	1
40	20	3.4	126.2	1
41	20	4.9	182.1	1
42	20	1.9	71.7	1
43	20	5.1	190	1
44	20	2.6	95.7	1
45	20	1.5	55.9	1
46	20	1.8	67.4	1
47	20	2.4	88.9	1
48	20	3.1	116.6	1
120	20	5	135.2	1
121	20	1.7	45.1	1
122	20	1.5	42.1	1
123	20	4.4	121	1
	20	3.5	97.4	1
124	20	2	55.1	1
125	20	1.8	49.2	1
49	20	2.5	59.1	1
50	20	2.5	59.3	1
51	20	1.6	37.6	1
52	20	6.2	145.7	1
	20	8.6	43.8	1
53	20	5.2	121.9	1
54	20	5	117	1
55	20	5.6	131.5	1
56	20	3.6	85.4	1
57	20	1.7	39.1	1
58	20	2.6	61.2	1

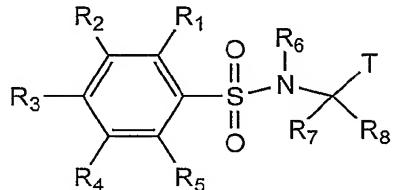
Table 17 – continued

Example	Conc (µg/ml)	APPI Fold Increase	APPI % of Example #98	(%)APPI Toxicity
59	20	3.2	76.3	1
60	20	4.6	109.3	1
61	20	6.5	152.3	1
62	20	1.8	42.2	1
63	20	2	47.9	1
64	20	1.7	39.3	1
65	20	1.9	44.6	1
66	20	5.5	129.1	1
67	20	3.9	91.5	1
68	20	2	47.5	1
69	20	3.1	73	1
70	20	2	48	1
71	20	1.9	43.9	1
72	20	3.2	76.4	1
73	20	5.4	127.1	1
74	20	2.5	57.7	1
75	20	4.8	112.3	1
76	20	5.8	135.2	1
77	20	5.9	139.8	1
78	20	4.4	102.4	1
79	20	1.5	34.1	1
80	20	3.9	91.1	1
81	20	5	118	1
82	20	2.6	66	1
83	20	3.4	86.8	1
84	20	3.4	86.6	1
85	20	3.4	87.3	1
86	20	1.6	41.4	1
87	20	8.8	223.8	1
88	20	6.4	27.9	1
89	20	22.4	97.9	1

All publications cited in this specification are incorporated herein by reference. While the invention has been described with reference to a particularly preferred embodiment, it will be appreciated that modifications can be made without departing from the spirit of the invention. Such modifications are intended to fall within the scope of the appended claims.

## WHAT IS CLAIMED IS:

1. A method of lowering beta amyloid levels comprising the steps of:
  - a) delivering to a patient, a pharmaceutically acceptable amount of a compound of Formula I:



I

wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H and halogen;

R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;  
or

R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;

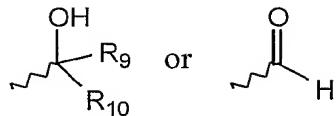
R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

R<sub>7</sub> is selected from the group consisting of H, lower alkyl, and cycloalkyl;

R<sub>8</sub> is selected from the group consisting of lower alkyl, substituted alkyl, cycloalkyl, phenyl, substituted phenyl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-3-indole, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-methoxyphenyl, CH(lower alkyl) phenyl, and CH(OH)-4-SCH<sub>3</sub>-phenyl; or

R<sub>7</sub> and R<sub>8</sub> are fused to form a saturated carbon-based ring;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

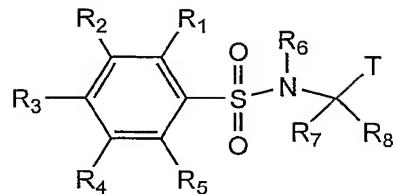
R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, lower alkenyl, CF<sub>3</sub>, methyl-substituted alkenyl, lower alkynyl, cycloalkyl, substituted phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
  - (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring;
  - (v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and
  - (vi) at least one of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, and R<sub>5</sub> is halogen unless R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;
- or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof; and
- b) monitoring levels of beta-amyloid in the patient.

2. Use of a pharmaceutically acceptable amount of a compound of Formula I in preparation of a medicament for lowering beta amyloid levels in a subject, characterized by Formula I being:



wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H and halogen;

R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;

or

R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;

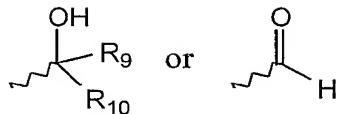
R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

R<sub>7</sub> is selected from the group consisting of H, lower alkyl, and cycloalkyl;

R<sub>8</sub> is selected from the group consisting of lower alkyl, substituted alkyl, cycloalkyl, phenyl, substituted phenyl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-3-indole, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-methoxyphenyl, CH(lower alkyl) phenyl, and CH(OH)-4-SCH<sub>3</sub>-phenyl; or

R<sub>7</sub> and R<sub>8</sub> are fused to form a saturated carbon-based ring;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, lower alkenyl, CF<sub>3</sub>, methyl-substituted alkenyl, lower alkynyl, cycloalkyl, substituted phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

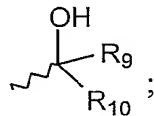
R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
  - (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring;
  - (v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and
  - (vi) at least one of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, and R<sub>5</sub> is halogen unless R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;
- or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof; and

further characterized by a step of monitoring beta-amyloid in the subject following delivery of said medicament to the subject.

3. The method according to claim 1 or use according to claim 2, wherein:  
T is:



R<sub>1</sub>, R<sub>2</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub>, R<sub>9</sub>, and R<sub>10</sub> are H;

R<sub>3</sub> is halogen; and

R<sub>8</sub> is lower alkyl of S-stereochemistry at the carbon atom to which N, T, R<sub>7</sub>, and R<sub>8</sub> are attached.

4. The method according to claim 1 or use according to claim 2, wherein said pharmaceutically acceptable salt of said compound is selected from the group consisting of salts of sodium hydroxide, potassium hydroxide, calcium hydroxide, magnesium hydroxide, diethanolamine, ethylene amine, salts of bases, and mixtures thereof.

5. The method according to claim 1 or use according to claim 2, wherein said compound is delivered to said subject orally or by injection.

6. The method according to claim 1 or use according to claim 2, wherein said compound is selected from the group consisting of 2-bromo-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 3-bromo-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 3-chloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 4-chloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]-1,2,3-benzoxadiazole-7-sulfonamide, 2-chloro-4-fluoro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 5-chloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]-2-methoxybenzenesulfonamide, 2-chloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl]-6-methylbenzenesulfonamide, 3,5-dichloro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 2,4-difluoro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 4-fluoro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 2-fluoro-N-[(1S,2S) -1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, N-[(1S,2S) -1-

(hydroxymethyl)-2-methylbutyl]naphthalene-1-sulfonamide, N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]naphthalene-2-sulfonamide 3-amino-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, N-[(1S)-1-benzyl-2-hydroxyethyl]-4-bromobenzenesulfonamide, 4-bromo-N-[(1S)-1-cyclohexyl-2-hydroxyethyl]benzenesulfonamide, 4-bromo-N-[(1R)-2-hydroxy-1-(4-hydroxyphenyl)ethyl]benzenesulfonamide, 4-bromo-N-[(1S)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-(1H-indol-2-ylmethyl)ethyl]benzenesulfonamide, 4-bromo-2,5-difluoro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 2,5-dibromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 3,4-dibromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 2,3-dichloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 3,4-dichloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 2,4,5-trichloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-bromo-2,5-difluoro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide, 3,4-dichloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide, 2,4,6-trichloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide, 3,4-dibromo-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide, 3,4-dichloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide, 2,4,5-trichloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide, 2,4,6-trichloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl]benzenesulfonamide, 4-bromo-N-[(1R,2R)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-bromo-N-[(1S)-1-(hydroxymethyl)-1,2-dimethylpropyl]benzenesulfonamide, 4-bromo-N-[(1S)-1-(hydroxymethyl)-2-phenylpropyl]benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-chloro-N-[(1S)-1-(hydroxymethyl)-1,2-dimethylpropyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-phenylpropyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, N-allyl-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, N-([1,1'-biphenyl]-4-ylmethyl)-4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, tert-butyl 2-{[(4-chlorophenyl)sulfonyl][(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]amino}ethylcarbamate, 4-chloro-N-(4-chlorobenzyl)-N-[(1S,2S)-1-

(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 4-chloro-N-(cyclobutylmethyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-chloro-N-(3,4-dimethoxybenzyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]benzenesulfonamide, 4-chloro-N-(2-furymethyl)-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-N-[2-(methylthio)ethyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-N-(3-phenylprop-2-ynyl)benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl)propyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-methyloctyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-phenylpropyl]benzenesulfonamide, 4-chloro-N-[(1S)-2-ethyl-1-(hydroxymethyl)butyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)-4-methylpentyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylpentyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)pentyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-4-methyl-2-propylpentyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl)pentyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-propyloctyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-phenylpentyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylheptyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl) heptyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-1-(hydroxymethyl)-2-pentyloctyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-phenylpropyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-4-methyl-2-phenylpentyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-phenyloctyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)butyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)-4-methylpentyl]benzenesulfonamide, 4-chloro-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)octyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2,3-dimethylbutyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-isopropyloctyl]benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl)propyl]benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-methyloctyl]

benzenesulfonamide, 4-bromo-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)-4-methylpentyl] benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-(4-methoxyphenyl) butyl]benzenesulfonamide, 4-bromo-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)octyl] benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylpentyl] benzenesulfonamide, 4-bromo-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl)pentyl] benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-4-methyl-2-propylpentyl]benzenesulfonamide, 4-bromo-N-[(1S,2R)-1-(hydroxymethyl)-2-propyloctyl]benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylheptyl]benzenesulfonamide, 4-bromo-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl) heptyl]benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-phenylpropyl] benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-phenylbutyl] benzenesulfonamide, 4-bromo-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)propyl] benzenesulfonamide, 4-bromo-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)butyl] benzenesulfonamide, 4-bromo-N-[(1S,2R)-2-(2-furyl)-1-(hydroxymethyl)-4-methylpentyl]benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-isopropyl-4-methylpentyl]benzenesulfonamide, 4-chloro-N-[(1S,2S)-2-ethyl-1-(hydroxymethyl) octyl] benzenesulfonamide, 4-chloro-N-[(1S,2R)-2-ethyl-1-(hydroxymethyl)octyl] benzenesulfonamide, 4-chloro- N-methyl-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-benzenesulfonamide, 4-chloro-N-[(1S)-1-(hydroxymethyl)-3-methylbutyl] benzenesulfonamide, 4-chloro-N-[(1R,2S)-2-hydroxy-1-methyl-2-phenylethyl] benzenesulfonamide, 4-bromo-N-[1-(hydroxymethyl)cyclopentyl]benzenesulfonamide, 4-chloro-N-[(1S)-2-cyclohexyl-1-(hydroxymethyl)ethyl]benzenesulfonamide, N-{(1S)-1-[4-(benzyloxy)benzyl]-2-hydroxyethyl}-4-chlorobenzenesulfonamide, 4-chloro-N-[(1R)-1-(hydroxymethyl)-1-methylpropyl]benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl]-benzenesulfonamide, 4-bromo-N-[1-(hydroxymethyl) pentyl]benzenesulfonamide, 4-bromo-N-[(1R,2S)-2-hydroxy-1-methyl-2-phenylethyl] benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-phenylethyl]benzenesulfonamide, 4-bromo-N-[(1R)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide, 4-chloro-N-[1-

(hydroxymethyl)cyclopentyl]benzenesulfonamide, 4-bromo-N-[1-(hydroxymethyl)butyl] benzenesulfonamide, 3-chloro-N-[1-(hydroxymethyl)butyl]benzenesulfonamide, 3-chloro-N-[(1S)-2-cyclohexyl-1-(hydroxymethyl)ethyl]benzenesulfonamide, 3-chloro-N-[(1R)-1-(hydroxymethyl)-3-(methylthio)propyl]benzenesulfonamide, 3-chloro-N-[(1S)-1-(hydroxymethyl)propyl]benzenesulfonamide, 2-fluoro-N-[(1S)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide, 2-fluoro-N-[1-(hydroxymethyl)pentyl]benzenesulfonamide, 2-fluoro-N-[(1R,2S)-2-hydroxy-1-methyl-2-phenylethyl]benzenesulfonamide, 2-fluoro-N-[(1S)-2-hydroxy-1-phenylethyl]benzenesulfonamide, 2-fluoro-N-[(1R)-1-(hydroxymethyl)-3-methylbutyl]benzenesulfonamide, 2-fluoro-N-[1-(hydroxymethyl)cyclopentyl]benzenesulfonamide, N-[(1S)-2-cyclohexyl-1-(hydroxymethyl)ethyl]-2-fluorobenzenesulfonamide, 2-fluoro-N-[(1S,2S)-2-hydroxy-1-(hydroxymethyl)-2-[4-(methylthio)phenyl]ethyl]benzenesulfonamide, 2-fluoro-N-[(1S)-1-(hydroxy-1-methylethyl)]benzenesulfonamide, N-[(1S)-1-benzyl-2-hydroxyethyl]-2-fluorobenzenesulfonamide, 2-fluoro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide, 4-bromo-N-[1-(hydroxymethyl)cyclohexyl]benzenesulfonamide, 4-bromo-N-[2-(hydroxymethyl)bicyclo[2.2.1.]hept-2-yl]benzenesulfonamide, 4-bromo-N-[1-(hydroxymethyl)-2,3-dihydro-1H-inden-1-yl]benzenesulfonamide, 4-chloro-N-[1-(hydroxymethyl)cyclohexyl]benzenesulfonamide, 4-chloro-N-[1-(hydroxymethyl)-2,3-dihydro-1H-inden-1-yl]benzenesulfonamide, 4-chloro-N-(1-cyclobutyl-2-hydroxy-1-phenylethyl)benzenesulfonamide, 4-fluoro-N-[(1S,2S)-1-(hydroxyethyl)-2-methylbutyl]benzenesulfonamide, N-[(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl]-4-fluorobenzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]octyl]benzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl]benzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl]benzenesulfonamide, 4-fluoro-N-[(1S,2S)-1-[hydroxy(2-methylphenyl)methyl]-2-methylbutyl]benzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl]benzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-but enyl]benzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-

1-methylpropyl]-4-pentenyl}benzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, N-[(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl]-4-fluorobenzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]-3-pentenyl}benzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]-3-butenyl}benzenesulfonamide, 4-fluoro-N-[(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-[(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl]-4-fluorobenzenesulfonamide, 4-fluoro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide, 4-fluoro-N-[(1S,2S)-1-{hydroxy[4-(methylsulfanyl)phenyl]methyl}-2-methylbutyl}benzenesulfonamide, N-[(1S,2S)-1-[[4-(dimethylamino)phenyl](hydroxy)methyl]-2-methylbutyl]-4-fluorobenzenesulfonamide, 4-fluoro-N-[(1S,2S)-1-[hydroxy(1-naphthyl)methyl]-2-methylbutyl}benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(1-hydroxyethyl)-2-methylbutyl]benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-but enyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-[(4-fluorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]-3-pentenyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]-3-pentenyl}benzenesulfonamide, 4-bromo-N-[(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-

methylpropyl]butyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide, 4-bromo-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-pentynyl}benzenesulfonamide, 4-bromo-N-((1S,2S)-1-{hydroxy[4-(methylsulfanyl)phenyl]methyl}-2-methylbutyl) benzenesulfonamide, 4-bromo-N-[(1S,2S)-1-[[4-(dimethylamino)phenyl](hydroxy) methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-formyl-2-methylbutyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(1-hydroxyethyl)-2-methylbutyl] benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl] octyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl] heptyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl] hexyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[hydroxy(2-methylphenyl)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-butenyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-[(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-pentynyl}benzenesulfonamide, 4-chloro-N-((1S,2S)-1-{hydroxy[4-(methylsulfanyl)phenyl]methyl}-2-methylbutyl) benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[[4-(dimethylamino)phenyl] (hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-[hydroxy(1-naphthyl)methyl]-2-methylbutyl}benzenesulfonamide, 3-chloro-N-[(1S,2S)-1-(1-hydroxyethyl)-2-methylbutyl]benzenesulfonamide, 3-chloro-N-[(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 3-chloro-N-[(1S)-2-hydroxy-

1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-3-methyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-3,3-dimethyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-butenyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 3-chloro-N-{(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-4-methyl-1-[(1S)-1-methylpropyl]-3-pentenyl}benzenesulfonamide, 3-chloro-N-{(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl}benzenesulfonamide, 3-chloro-N-{(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide, 3-chloro-N-((1S,2S)-1-[hydroxy[4-(methylsulfanyl)phenyl]methyl]-2-methylbutyl)benzenesulfonamide, N-{(1S,2S)-1-[cyclopentyl(hydroxy)methyl]-2-methylbutyl}-2-fluorobenzenesulfonamide, 2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide, 2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]heptyl}benzenesulfonamide, 2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide, 2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-3-buteneyl}benzenesulfonamide, 2-fluoro-N-{(1S,2S)-1-[(4-fluorophenyl)(hydroxy)methyl]-2-methylbutyl}benzenesulfonamide, N-{(1S,2S)-1-[(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}-2-fluorobenzenesulfonamide, 2-fluoro-N-{(1S,2S)-1-[hydroxy(4-methoxyphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-{(1S)-4-(1,3-dioxan-2-yl)-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}-2-fluorobenzenesulfonamide, 4-bromo-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-methylbutyl]benzenesulfonamide, 4-bromo-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl}benzenesulfonamide, 4-bromo-N-{(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}benzenesulfonamide, 4-bromo-N-{(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl}

benzenesulfonamide, 4-bromo-N-{(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl} benzenesulfonamide, N-{(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}-4-bromo benzenesulfonamide, 4-bromo-N-{(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl] butyl}benzenesulfonamide, N-{(1S,2S)-1-[bis(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}-4-bromobenzenesulfonamide, 4-bromo-N-{(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-butenyl}benzenesulfonamide, 4-bromo-N-{(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl} benzenesulfonamide, 4-bromo-N-{(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}benzenesulfonamide, 4-bromo-N-((1S,2S)-1-{hydroxy[di(1-naphthyl)]methyl}-2-methylbutyl)benzenesulfonamide, 4-chloro-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-methylbutyl]benzenesulfonamide, 4-chloro-N-{(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide, N-{(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}-4-chlorobenzenesulfonamide, 4-chloro-N-{(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, 4-chloro-N-{(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-{(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}-4-chloro benzenesulfonamide, 4-chloro-N-{(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, 4-chloro-N-{(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-but enyl}benzenesulfonamide, 4-chloro-N-((1S,2S)-1-{hydroxy[di(1-naphthyl)]methyl}-2-methylbutyl)benzenesulfonamide, 4-chloro-N-[(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl}benzenesulfonamide, N-{(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}-4-chlorobenzenesulfonamide, 4-chloro-N-((1S,2S)-1-{hydroxy[di(1-naphthyl)]methyl}-2-methylbutyl)benzenesulfonamide, 4-fluoro-N-[(1S,2S)-1-(1-hydroxy-1-methylethyl)-2-methylbutyl]benzenesulfonamide, 4-fluoro-N-{(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide, 4-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl}benzenesulfonamide, N-{(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}-4-fluorobenzenesulfonamide, 4-fluoro-N-{(1S)-2-hydroxy-2-isopropyl-3-methyl-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide,

4-fluoro-N-{(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, N-{(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}-4-fluoro benzenesulfonamide, N-{(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}-4-fluorobenzenesulfonamide, 4-fluoro-N-{(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-but enyl}benzenesulfonamide, 4-fluoro-N-((1S,2S)-1-{hydroxy[bis(4-methoxyphenyl)]methyl}-2-methylbutyl) benzenesulfonamide, 4-fluoro-N-{(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl} benzenesulfonamide, N-{(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}-4-fluorobenzenesulfonamide, N-{(1S,2S)-1-[bis[4-(dimethylamino)phenyl] (hydroxy)methyl]-2-methylbutyl}-4-fluorobenzenesulfonamide, 4-fluoro-N-((1S,2S)-1-{hydroxy[di(1-naphthyl)]methyl}-2-methylbutyl)benzenesulfonamide, 3-chloro-N-{(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl}benzenesulfonamide, N-{(1S)-2-butyl-2-hydroxy-1-[(1S)-1-methylpropyl]hexyl}-3-chlorobenzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-2-isobutyl-4-methyl-1-[(1S)-1-methylpropyl]pentyl}benzenesulfonamide, 3-chloro-N-{(1S,2S)-1-[hydroxy(diphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-{(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}-3-chloro benzenesulfonamide, 3-chloro-N-{(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl}benzenesulfonamide, N-{(1S,2S)-1-[bis(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl}-3-chloro benzenesulfonamide, 3-chloro-N-{(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-but enyl}benzenesulfonamide, 3-chloro-N-((1S,2S)-1-{hydroxy[bis(4-methoxyphenyl)]methyl}-2-methylbutyl)benzenesulfonamide, 3-chloro-N-{(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl} benzenesulfonamide, N-{(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl}-3-chlorobenzenesulfonamide, 2-fluoro-N-{(1S)-2-hexyl-2-hydroxy-1-[(1S)-1-methylpropyl]octyl}benzenesulfonamide, 2-fluoro-N-{(1S)-2-hydroxy-1-[(1S)-1-methylpropyl]-2-pentylheptyl}benzenesulfonamide, 2-fluoro-N-{(1S,2S)-1-[hydroxy (diphenyl)methyl]-2-methylbutyl}benzenesulfonamide, N-{(1S)-2-allyl-2-hydroxy-1-[(1S)-1-methylpropyl]-4-pentenyl}-2-

fluorobenzenesulfonamide, N-[(1S)-2-ethyl-2-hydroxy-1-[(1S)-1-methylpropyl]butyl]-2-fluorobenzenesulfonamide, N-[(1S,2S)-1-[bis(4-fluorophenyl)(hydroxy)methyl]-2-methylbutyl]-2-fluorobenzenesulfonamide, N-[(1S,2S)-1-[bis(4-chlorophenyl)(hydroxy)methyl]-2-methylbutyl]-2-fluorobenzenesulfonamide, 2-fluoro-N-[(1S)-2-hydroxy-2-isopropenyl-3-methyl-1-[(1S)-1-methylpropyl]-3-but enyl] benzenesulfonamide, 2-fluoro-N-[(1S,2S)-1-{hydroxy[bis(4-methoxyphenyl)]methyl}-2-methylbutyl]benzenesulfonamide, 2-fluoro-N-[(1S,3E)-2-hydroxy-3-methyl-2-[(1E)-1-methyl-1-propenyl]-1-[(1S)-1-methylpropyl]-3-pentenyl] benzenesulfonamide, N-[(1S)-2-(3-but enyl)-2-hydroxy-1-[(1S)-1-methylpropyl]-5-hexenyl]-2-fluorobenzenesulfonamide, 4-chloro-N-[(1S)-1-cyclohexyl-2-hydroxyethyl] benzenesulfonamide, 4-chloro-N-[(1S)-2-hydroxy-1-phenylethyl]benzenesulfonamide, 4-chloro-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl]benzenesulfonamide, 4-bromo-N-[(1S)-1-(hydroxymethyl)-2-methylpropyl] benzenesulfonamide, 4-iodo-N-[(1S,2S)-1-(hydroxymethyl)-2-methylbutyl] benzenesulfonamide, and 4-chloro-N-[(1S)-1-(hydroxymethyl)-2,2-dimethylpropyl] benzenesulfonamide;

or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

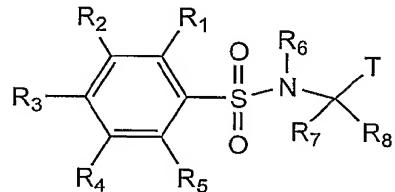
7. The method according to claim 1 or use according to claim 2, wherein the compound is 4-chloro-N-[(1S, 2S)-2-ethyl-1-(hydroxymethyl)butyl]benzenesulfonamide or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

8. The method according to claim 1 or use according to claim 2, wherein R<sub>2</sub> is bound to R<sub>1</sub> to form a 1,2,3-oxadiazole ring.

9. The method according to claim 1 or use according to claim 2, wherein R<sub>5</sub> is bound to R<sub>4</sub> to form a 1,2,3-oxadiazole ring.

10. A method of preventing or treating Alzheimer's disease, Down's Syndrome, mild cognitive impairment and other beta amyloid-involved diseases, comprising the steps of:

a) administering to a patient, a pharmaceutically acceptable amount of a compound, sufficient to alleviate the symptoms or progress of said disease, Formula I:



I

wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H and halogen;

R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;  
or

R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;

R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

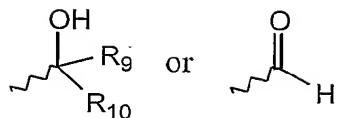
R<sub>7</sub> is selected from the group consisting of H, lower alkyl, and cycloalkyl;

R<sub>8</sub> is selected from the group consisting of lower alkyl, substituted alkyl, cycloalkyl, phenyl, substituted phenyl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-3-indole, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-methoxyphenyl, CH(lower alkyl) phenyl, and CH(OH)-4-SCH<sub>3</sub>-phenyl;

or

R<sub>7</sub> and R<sub>8</sub> are fused to form a saturated carbon-based ring;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

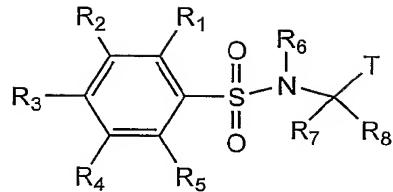
R<sub>9</sub> is H and R<sub>10</sub> is lower alkyl, lower alkenyl, methyl-substituted alkenyl, lower alkynyl, CF<sub>3</sub>, cycloalkyl, substituted phenyl, 1-naphthyl, or CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
  - (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring;
  - (v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and
  - (vi) at least one of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, and R<sub>5</sub> is halogen unless R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;
- or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof; and
- b) monitoring the patients for amelioration or stabilization of disease progress.

11. Use of a pharmaceutically acceptable amount of a compound of Formula I for the preparation of a medicament for preventing or treating Alzheimer's disease, Down's Syndrome, mild cognitive impairment and other beta amyloid-involved diseases, characterized by formula I being:



I

wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H and halogen;

R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;

or

R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;

R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

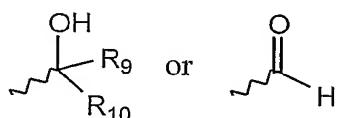
R<sub>7</sub> is selected from the group consisting of H, lower alkyl, and cycloalkyl;

R<sub>8</sub> is selected from the group consisting of lower alkyl, substituted alkyl, cycloalkyl, phenyl, substituted phenyl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-3-indole, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-methoxyphenyl, CH(lower alkyl) phenyl, and CH(OH)-4-SCH<sub>3</sub>-phenyl;

or

R<sub>7</sub> and R<sub>8</sub> are fused to form a saturated carbon-based ring;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

$R_9$  is H and  $R_{10}$  is lower alkyl, lower alkenyl, methyl-substituted alkenyl, lower alkynyl,  $CF_3$ , cycloalkyl, substituted phenyl, 1-naphthyl, or  $CH_2CH_2-1,3$ -dioxolane; or

$R_9$  and  $R_{10}$  are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when  $R_5$  is a methoxy;  $R_2$  is halogen and  $R_1$ ,  $R_3$ , and  $R_4$  are H;
- (ii) when  $R_5$  is a methyl;  $R_1$  is halogen and  $R_2$ ,  $R_3$ , and  $R_4$  are H;
- (iii) when  $R_4$  is an amino;  $R_3$  is halogen and  $R_1$ ,  $R_2$ , and  $R_5$  are H;
- (iv) when  $R_2$  is  $N=N$  and  $R_1$  is O;  $R_2$  is bound to  $R_1$  to form a heterocyclic ring;

(v) when  $R_4$  is  $N=N$  and  $R_5$  is O;  $R_4$  is bound to  $R_5$  to form a heterocyclic ring; and

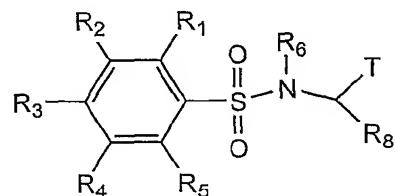
(vi) at least one of  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ , and  $R_5$  is halogen unless  $R_1$  and  $R_2$ ;  $R_2$  and  $R_3$ ;  $R_4$  and  $R_5$ ; or  $R_3$  and  $R_4$  are fused to form a carbon-based, naphthalene ring with the benzene ring;

or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof; and

further characterized by the step of monitoring the subject for amelioration or stabilization of disease progress following delivery of the medicament to the subject.

12. The method according to claim 10 or use according to claim 11, wherein  $R_3$  is halogen and  $R_8$  is a lower alkyl of S-stereochemistry at the carbon atom to which N, T,  $R_7$ , and  $R_8$  are attached; or a pharmaceutically acceptable salt.

13. A compound of Formula Ia:



Ia

wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H and halogen;

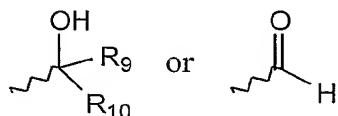
R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;

R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

R<sub>8</sub> is selected from the group consisting of n-propyl, iso-propyl, iso-butyl, n-butyl, t-butyl, substituted butyl, optionally substituted hexyl, optionally substituted heptyl, cycloalkyl, CH<sub>2</sub> cycloalkyl, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-methoxyphenyl, CH(lower alkyl) phenyl, CH(OH)-4-SCH<sub>3</sub>-phenyl, and (CH<sub>2</sub>)<sub>2</sub>-S-lower alkyl;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, lower alkenyl, CF<sub>3</sub>, methyl-substituted alkenyl, lower alkynyl, cycloalkyl, substituted phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

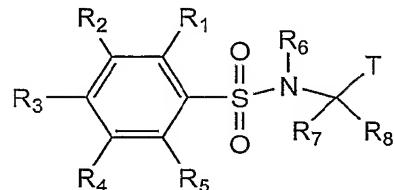
- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
- (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
- (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
- (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring;
- (v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a

heterocyclic ring; and

(vi) one or more of R<sub>1</sub> to R<sub>5</sub> is a halogen;  
or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

14. A pharmaceutical composition comprising a physiologically compatible carrier and a compound according to claim 13.

15. A compound of Formula I:



I

wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H and halogen;

R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O; or

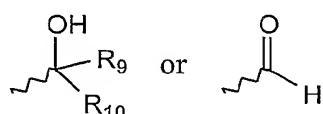
R<sub>1</sub> and R<sub>2</sub> or R<sub>4</sub> and R<sub>5</sub> are fused to form a carbon-based, unsaturated ring;

R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

R<sub>7</sub> is selected from the group consisting of H, lower alkyl, and cycloalkyl;

R<sub>8</sub> is selected from the group consisting of benzyl and substituted benzyl;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, lower alkenyl, CF<sub>3</sub>, methyl-substituted alkenyl, lower alkynyl, cycloalkyl, substituted phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

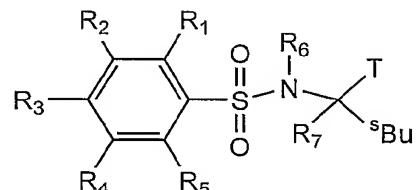
R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
  - (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring;
  - (v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and
  - (vi) one or more of R<sub>1</sub> to R<sub>5</sub> is a halogen;
- or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

16. A pharmaceutical composition comprising a physiologically compatible carrier and a compound according to claim 16.

17. A compound of Formula Ib:



Ib

wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H, bromine, fluorine, and iodine;

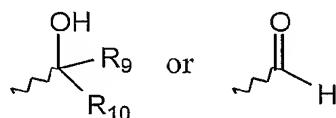
R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

$R_5$  is selected from the group consisting of H, halogen, methoxy, methyl, and O;

$R_6$  is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl,  $CH_2$  cycloalkyl,  $CH_2$ -2-furan,  $(CH_2)_2SCH_3$ , and  $(CH_2)_2NHBOC$ ;

$R_7$  is selected from the group consisting of H, lower alkyl, and cycloalkyl;

T is



$R_9$  and  $R_{10}$  are H; or

$R_9$  is H and  $R_{10}$  is selected from the group consisting of lower alkyl, lower alkenyl,  $CF_3$ , methyl-substituted alkenyl, lower alkynyl, cycloalkyl, substituted phenyl,

1-naphthyl, and  $CH_2CH_2$ -1,3-dioxolane; or

$R_9$  and  $R_{10}$  are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when  $R_5$  is a methoxy;  $R_2$  is halogen and  $R_1$ ,  $R_3$ , and  $R_4$  are H;
- (ii) when  $R_5$  is a methyl;  $R_1$  is halogen and  $R_2$ ,  $R_3$ , and  $R_4$  are H;
- (iii) when  $R_4$  is an amino;  $R_3$  is halogen and  $R_1$ ,  $R_2$ , and  $R_5$  are H;
- (iv) when  $R_2$  or  $R_4$  is  $N=N$ ;  $R_1$  or  $R_5$  is O and  $R_2$  or  $R_4$  is bound to

$R_1$  or

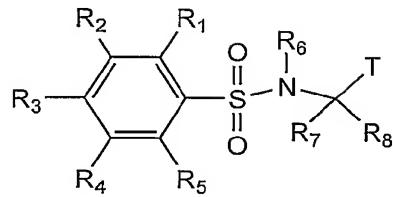
$R_5$  to form a heterocyclic ring; and

- (v) one or more of  $R_1$  to  $R_5$  is a halogen;

or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

18. A pharmaceutical composition comprising a physiologically compatible carrier and a compound according to claim 17.

19. A compound of Formula I:



I

wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H and halogen;

R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

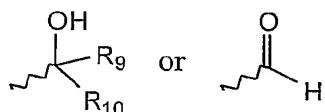
R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;

R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

R<sub>7</sub> is selected from the group consisting of lower alkyl and cycloalkyl;

R<sub>8</sub> is selected from the group consisting of cycloalkyl, phenyl, substituted phenyl, CH<sub>2</sub> cycloalkyl, CH(lower alkyl)-2-furan, CH(lower alkyl)-4-methoxyphenyl, CH(lower alkyl) phenyl, and CH(OH)-4-SCH<sub>3</sub>-phenyl;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, lower alkenyl, CF<sub>3</sub>, methyl-substituted alkenyl, lower alkynyl, cycloalkyl, substituted phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

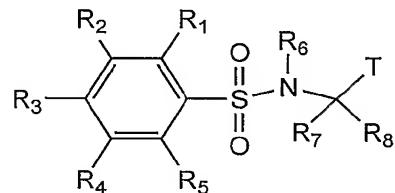
R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
  - (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring; and
  - (v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and
  - (vi) one or more of R<sub>1</sub> to R<sub>5</sub> is a halogen;
- or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

20. A pharmaceutical composition comprising a physiologically compatible carrier and a compound according to claim 19.

21. A compound of Formula I:



I

wherein:

- R<sub>1</sub> is selected from the group consisting of H, halogen, and O;
- R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;
- R<sub>3</sub> is selected from the group consisting of H and halogen;
- R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;
- R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;
- or

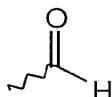
R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;

R<sub>6</sub> is selected from the group consisting of H, lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

$R_7$  is selected from the group consisting of H, lower alkyl, and cycloalkyl;  
 $R_8$  is selected from the group consisting of cycloalkyl, phenyl, substituted phenyl, benzyl, substituted benzyl,  $CH_2$  cycloalkyl,  $CH(lower\ alkyl)$ -2-furan,  $CH(lower\ alkyl)$ -4-methoxyphenyl,  $CH(lower\ alkyl)$  phenyl, and  $CH(OH)$ -4-SCH<sub>3</sub>-phenyl;  
or

$R_7$  and  $R_8$  are fused to form a saturated carbon-based ring;

T is



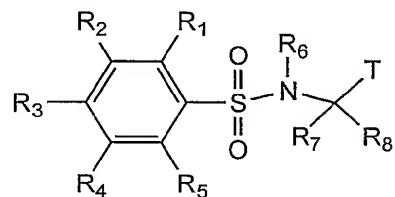
wherein:

- (i) when  $R_5$  is a methoxy;  $R_2$  is halogen and  $R_1$ ,  $R_3$ , and  $R_4$  are H;
- (ii) when  $R_5$  is a methyl;  $R_1$  is halogen and  $R_2$ ,  $R_3$ , and  $R_4$  are H;
- (iii) when  $R_4$  is an amino;  $R_3$  is halogen and  $R_1$ ,  $R_2$ , and  $R_5$  are H;
- (iv) when  $R_2$  is N=N and  $R_1$  is O;  $R_2$  is bound to  $R_1$  to form a heterocyclic ring;
- (v) when  $R_4$  is N=N and  $R_5$  is O;  $R_4$  is bound to  $R_5$  to form a heterocyclic ring;
- (vi) when each of  $R_1$ ,  $R_2$ ,  $R_4$ ,  $R_5$ , and  $R_6$  is H,  $R_3$  is halogen, and  $R_7$  is H, then  $R_8$  is C<sub>5</sub> to C<sub>8</sub> alkyl or  $R_7$  and  $R_8$  are fused to form a saturated carbon-based ring;
- (vii) when each of  $R_3$ ,  $R_4$ ,  $R_5$ ,  $R_6$ , and  $R_7$  is H and  $R_1$  and  $R_2$  are fused to form a carbon-based naphthalene ring, then  $R_8$  is selected from the group consisting of lower alkyl, cycloalkyl, phenyl, substituted phenyl, benzyl, substituted benzyl,  $CH_2$  cycloalkyl,  $CH(lower\ alkyl)$ -2-furan,  $CH(lower\ alkyl)$ -4-methoxyphenyl,  $CH(lower\ alkyl)$  phenyl, and  $CH(OH)$ -4-SCH<sub>3</sub>-phenyl;
- (viii) when each of  $R_1$ ,  $R_2$ ,  $R_4$ ,  $R_5$ , and  $R_6$  is H and  $R_3$  is halogen, then  $R_7$  and  $R_8$  are not both CH<sub>3</sub>; and

(ix) at least one of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, and R<sub>5</sub> is halogen unless R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;  
or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

22. A pharmaceutical composition comprising a physiologically compatible carrier and a compound according to claim 21.

23. A compound of Formula I:



I

wherein:

R<sub>1</sub> is selected from the group consisting of H, halogen, and O;

R<sub>2</sub> is selected from the group consisting of H, halogen, and N=N;

R<sub>3</sub> is selected from the group consisting of H and halogen;

R<sub>4</sub> is selected from the group consisting of H, halogen, amino, and N=N;

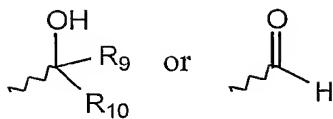
R<sub>5</sub> is selected from the group consisting of H, halogen, methoxy, methyl, and O;  
or

R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;

R<sub>6</sub> is selected from the group consisting of lower alkyl, lower alkenyl, 3-phenyl-2-propyn-1-yl, benzyl, substituted benzyl, CH<sub>2</sub> cycloalkyl, CH<sub>2</sub>-2-furan, (CH<sub>2</sub>)<sub>2</sub>SCH<sub>3</sub>, and (CH<sub>2</sub>)<sub>2</sub>NHBOC;

R<sub>7</sub> and R<sub>8</sub> are fused to form a saturated carbon-based ring;

T is



R<sub>9</sub> and R<sub>10</sub> are H; or

R<sub>9</sub> is H and R<sub>10</sub> is selected from the group consisting of lower alkyl, lower alkenyl, CF<sub>3</sub>, methyl-substituted alkenyl, lower alkynyl, cycloalkyl, substituted phenyl, 1-naphthyl, and CH<sub>2</sub>CH<sub>2</sub>-1,3-dioxolane; or

R<sub>9</sub> and R<sub>10</sub> are independently selected from the group consisting of lower alkyl, lower alkenyl, phenyl, 4-substituted-phenyl, and 1-naphthyl;

wherein:

- (i) when R<sub>5</sub> is a methoxy; R<sub>2</sub> is halogen and R<sub>1</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (ii) when R<sub>5</sub> is a methyl; R<sub>1</sub> is halogen and R<sub>2</sub>, R<sub>3</sub>, and R<sub>4</sub> are H;
  - (iii) when R<sub>4</sub> is an amino; R<sub>3</sub> is halogen and R<sub>1</sub>, R<sub>2</sub>, and R<sub>5</sub> are H;
  - (iv) when R<sub>2</sub> is N=N and R<sub>1</sub> is O; R<sub>2</sub> is bound to R<sub>1</sub> to form a heterocyclic ring;
  - (v) when R<sub>4</sub> is N=N and R<sub>5</sub> is O; R<sub>4</sub> is bound to R<sub>5</sub> to form a heterocyclic ring; and
  - (vi) at least one of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, and R<sub>5</sub> is halogen unless R<sub>1</sub> and R<sub>2</sub>; R<sub>2</sub> and R<sub>3</sub>; R<sub>4</sub> and R<sub>5</sub>; or R<sub>3</sub> and R<sub>4</sub> are fused to form a carbon-based, naphthalene ring with the benzene ring;
- or a pharmaceutically acceptable salt, metabolite, hydrate, or prodrug thereof.

24. A pharmaceutical composition comprising a physiologically compatible carrier and a compound according to claim 23.

**INTERNATIONAL SEARCH REPORT**

International application No. PCT/US03/18198
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**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : A61K 31/18; C07C 311/17  
US CL : 514/604; 564/93

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
U.S. : 514/604; 564/93

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
CAS ONLINE

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	STN International CAPLUS Database, Accession No. 1994:270114; ITO et al. 'Preparation of (pyridylalkyl) amine derivatives as thromboxane A2 antagonists and thromboxane A2 synthetase inhibitors'. JP 05148233, 15 June 1993, abstract.	13, 14

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "B" earlier application or patent published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

24 September 2003 (24.09.2003)

Date of mailing of the international search report

03 NOV 2003

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
Facsimile No. (703)305-3230

Authorized officer

Sonya Wright

Telephone No. (703) 308-1235

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US03/18198

**Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)**

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claim Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claim Nos.: 1-12 and 15-24  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
Please See Continuation Sheet
  
3.  Claim Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**  

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

PCT/US03/18198

**Continuation of Box I Reason 2:**

In the claims the numerous variables, their voluminous, complex meanings, and their many permutations and combinations make it virtually impossible to determine the full scope and complete meaning of the claimed subject matter. As presented the claimed subject matter cannot be regarded as being a clear and concise description for which protection is sought and as such the listed claims do not comply with the requirements of PCT Article 6. Thus it is impossible to carry out a meaningful search on the same. The search has been limited to the invention of the first depicted Example as well as similar Examples in Table 1. Therefore, claims 13 and 14 have been searched to the extent of Examples 1-3 and 5-11 only in Table 1.